292

PROPERTY OF
L. F. BLANKENSHIP
3924 MEADE ST.
DENVER, COLORADO

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SUPPLEMENTAL DATA TO PHOTOFACT FOLDER 5 IN SET 279

Firestone Models 13-G-176, 13-G-178, 13-G-179 (Code 334-4-AM51A) were covered in Photofact Folder 5 — Set 279.

Model 13-G-176, 13-G-178 and 13-G-179 (Code 334-4-AM56A) are identical to the models covered, except for the changes given in this bulletin.

Model 13-G-178 (Code 334-4-AM56B) is identical to models 13-G-176, 13-G-178 and 13-G-179 (Code 334-4-AM56A), except a different tuner (part #25A1127) is incorporated. A schematic of this tuner is given in this bulletin. Alignment procedure will be the same as given in Photofact Folder 5 — Set 279.

COMPONENT CHANGES

C33 is increased from 1MMF to 1.5MMF.

C35 is increased from 470MMF to 680MMF.

R55 is increased from 33KΩ to 100KΩ.

R110 is decreased from 2KΩ to 1.7KΩ.

NEW PICTURE TUBE

The picture tube (V23) is changed to a 21AWP4.

NEW HORIZONTAL OUTPUT TRANSFORMER

T3, horizontal output transformer, changed to part #53X346.

The correct replacements and terminal connection data are given in this bulletin.

HALLDORSON	MERIT	RCA	RAM	STANCOR	THORDARSON	TRIAD
FB411 & RF800 *	HVO-9 & MWC-1 *	232T1 & 212R1 *	X110 *	A-8252 & WC-5 *	FLY-37 *	D-35 & WC-12

*HORIZONTAL OUTPUT TRANSFORMER CONNECTION DATA

Use Original Width Coil Unless Replacement Type Is Listed

	ORIGINAL TERMINAL CONNECTIONS	Halldorson Replacement Connections	Merit Replacement Connections	RCA Replacement Connections	Ram Replacement Connections	Stancor Replacement Connections	Thordarson Replacement Connections	Triad Replacement Connections
	6	9	9	10	13	9	13	10
	5	8	8	8	Jumper 10 & 11	Jumper 8 & 7	Jumper 10 & 11	8
	4	5	5	7	6	5	6	7
	3	See Note ②	See Note ②	See Note ②	5 or 4	See Note ②	5 or 4	See Note ②
	2	T	T	NC	2	3	2	NC
	1	1	1	3	1	1	1	3
	A	Term. #3 of RF800	Orange Term. of MWC-1	2	9	Red Term. of WC-5	9	2
	G	Term. #4 of RF800	Black Term. of MWC-1	1	8	Blue Term. of WC-5	8	1
Connect Width Coil Across →	2 &1	Term. #1 & #2 of RF800 across T & 1	Red & blue terms. of MWC-1 across T & 1	212R1 across 2 & 1	2 & 1	Orange & black term. of WC-5 across 3 & 1	2 & 1	Red & blue terms. of WC-12 across 2 & 1
Special Notes →		①②③	①②③	①②		①② ③		①②④

① Drill new mounting holes.
② Connect a 47MMF or a 56MMF capacitor from open end of R107 (original terminal #3 connection) to terminal #3 of yoke (red lead).
③ If the picture is out of phase, reverse width coil primary or secondary.
④ Jumper terminals #9 and "T".

PRODUCTION CHANGES
BULLETIN 133

FIRESTONE MODELS 13-G-176, 13-G-178, 13-G-179 (Code 334-4-AM56A)

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PRODUCTION CHANGES
BULLETIN 133

HOWARD W. SAMS & CO., INC. • Indianapolis 5, Indiana

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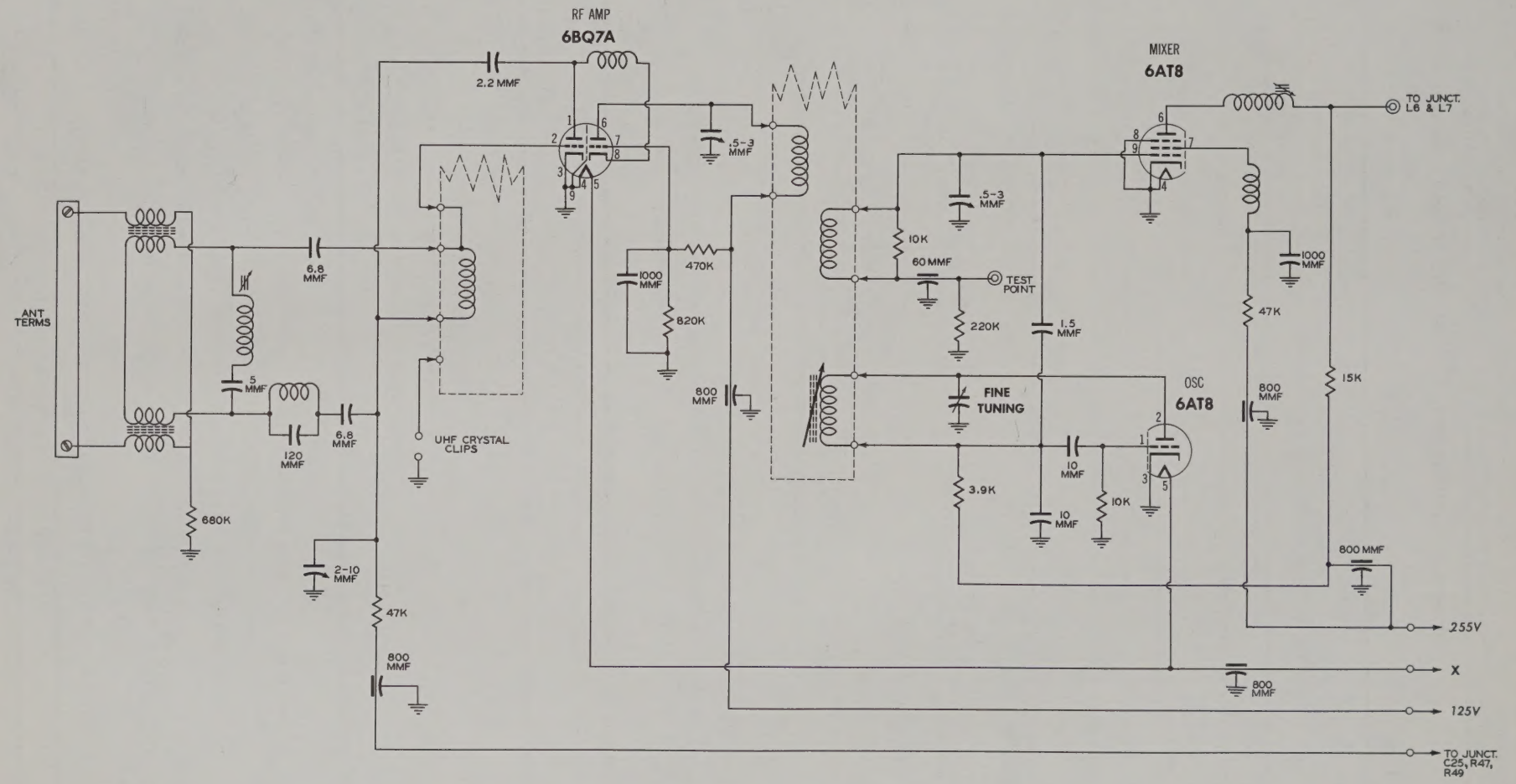
RF AMP
6BQ7A
MIXER
6AT8
OSC
6AT8
ANT TERMS
2.2 MMF
6.8 MMF
.5 MMF
120 MMF
6.8 MMF
680K
2-10 MMF
47K
800 MMF
UHF CRYSTAL CLIPS
.5-3 MMF
1000 MMF
470K
820K
800 MMF
.5-3 MMF
10K
60 MMF
TEST POINT
220K
1.5 MMF
FINE TUNING
10 MMF
3.9K
10K
10 MMF
TO JUNCT. L6 & L7
1000 MMF
47K
800 MMF
15K
800 MMF
255V
X
800 MMF
125V
TO JUNCT. C25, R47, R49

SUPPLEMENTAL DATA TO PHOTOFACT FOLDER 7 IN SET 225

BUICK MODEL 981322

Buick Model 981323 was covered in Photofact Folder 7 — Set 225.

Model 981322 (For Series 40, 1953 Buick cars) is identical to Model 981323, except for the following changes:

COMPONENT CHANGES

V1 changed from a 12BA6 to a 6BA6.

V2 changed from a 12BE6 to a 6BE6.

V3 changed from a 12BA6 to a 6BA6.

V4 changed from a 12BF6 to a 6SR7.

V5 changed from a 12V6GT to a 6V6GT.

V6 changed from a 12V6GT to a 6V6GT.

C22 is decreased from .007MFD to .006MFD.

R30 is decreased from 820Ω to 220Ω.

C19 and R29 are omitted.

M1 (Vibrator) changed to part #8542.

M2 (Fuse) changed to 15 Amp. (part #120151).

M3 (Dial Light) changed to a #55 bayonet.

T2 (Input Transformer) changed to part #6060.

FILAMENT CIRCUIT CHANGES

Pins 4 and 5 of V7 are grounded and the filament voltage is connected to pin 9.

SUPPLEMENTAL DATA TO PHOTOFACT FOLDER 8 IN SET 134

MOTOROLA MODELS 1L3TC, 1L3TC-12, 1L5TC, 1L5TC-12

Motorola chassis 1A was covered in Photofact Folder 8 — Set 134.

Models 1L3TC, 1L3TC-12, 1L5TC and 1L5TC-12 are electrically identical, except for the following changes:

R7 is decreased from 330Ω to 150Ω in models 1L3TC and 1L5TC.

SP1 (Speaker) changed to part #50B30876 , 50B521974 or 50C32450.

M5 (Spark Plate) changed to part #1A510791 or 64K531672 (copper foil type).

R1 (Volume & tone control) changed to part #18B513470.

M2 (Fuse) changed to part #65K12894 (14 Amp.) in Model 1L3TC.

M2 (Fuse) changed to part #65X12894 (14 Amp.) in Model 1L5TC.

M2 (Fuse) changed to part #65X16248 (9 Amp.) in Model 1L5TC-12.

12 VOLT SYSTEM

Models 1L3TC-12 and 1L5TC use a 12 volt power supply. The following changes were made.

V1 changed from a 6BA6 to a 12BA6.

V2 changed from a 6BE6 to a 12BE6.

V3 changed from a 6BA6 to a 12BA6.

V4 changed from a 6AT6 to a 12AT6.

V5 changed from a 6AQ5 to a 12AQ5.

V6 changed from a 6X4 to a 12X4.

M1 (Vibrator) changed to part #48B522000.

T1 (Transformer, vibrator) changed to part #25C530737.

L7 (Hash Choke) changed to part #24A521816.

SUPPLEMENTAL DATA TO PHOTOFACT FOLDER 10 IN SET 251

HALLICRAFTERS MODELS S-93, TW-500, TW-600

Hallicrafters models TW-500 and TW-600 were covered in Photofact Folder 10 — Set 251.

Model S-93 is identical to the above named models.

Late production changes covering models S-93, TW-500 and TW-600 are given below.

Run 2 — The diode filter unit consisting of R20, C26A and C26B is changed to a PC-50. In the PC-50, C26A and C26B are each 100MMF.

Run 3 — R10 is decreased from 10Meg to 1Meg. In some sets R10 was 8.6Meg (3.9Meg resistor located on the tuner chassis in series with a 4.7Meg resistor located on the main chassis).

Run 4 — C1D is decreased from 200MFD, 10V to 80MFD, 25V.

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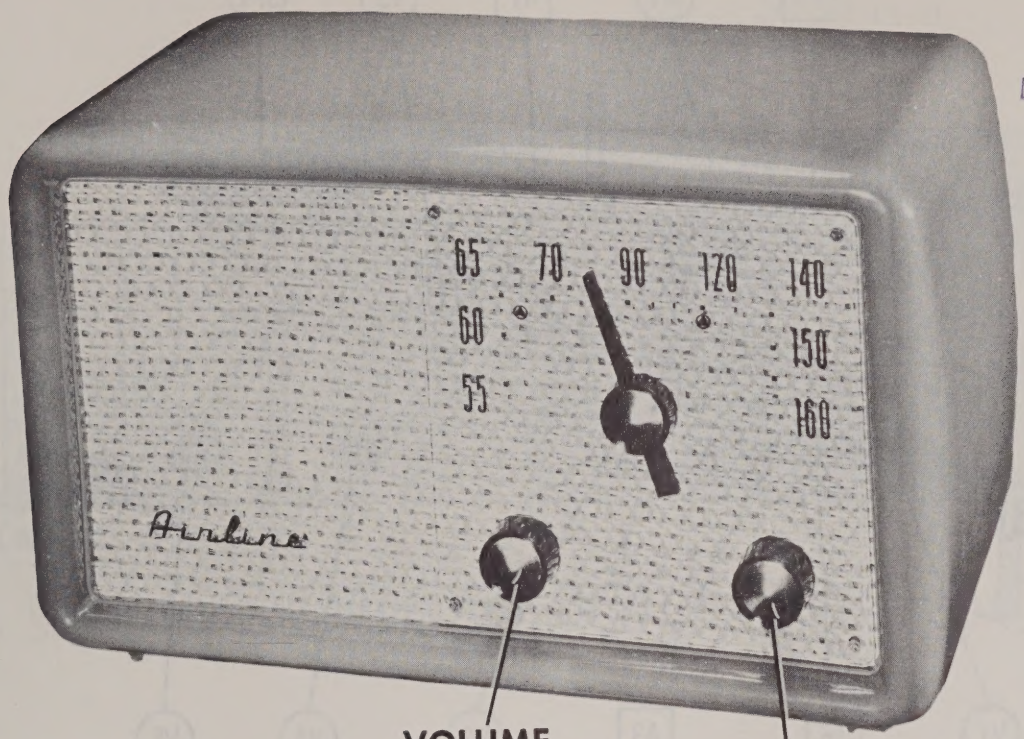
AIRLINE MODELS
GSE-1606A, GSE-1607A



VOLUME CONTROL ON-OFF SWITCH

TUNING

AIRLINE MODELS
GSE-1606A, GSE-1607A

TRADE NAME	Airline Models GSE-1606A, GSE-1607A
MANUFACTURER	Montgomery Ward & Co., 619 Chicago Ave., Chicago, Ill.
TYPE SET	AC-DC Operated AM Superheterodyne Receiver
TUBES (Five)	Types 12BE6 Conv., 12BA6 IF Amp., 12AV6 Det.-AVC-AF Amp., 50C5 Output, 35W4 Rectifier
POWER SUPPLY	110-120 Volts AC-DC
RATING	.22 Amp. @ 117 Volts AC
TUNING RANGE—BROADCAST	540KC-1660KC

ALIGNMENT INSTRUCTIONS—READ CAREFULLY BEFORE ATTEMPTING ALIGNMENT

Volume control should be at maximum position. Output of signal generator should be no higher than necessary to obtain an output reading. Use an insulated alignment screwdriver for adjusting.
Loop should be maintained in same relative position to chassis as when receiver is in cabinet.
Use isolation transformer, if available. If not, connect a .1MFD capacitor in series with low side of signal generator and B-.
To set pointer, turn tuning capacitor fully closed and set pointer to last reference mark at low frequency end of dial.

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	RADIO DIAL SETTING	OUTPUT METER	ADJUST	REMARKS
1.	.02MFD	High side to antenna terminal lug (on gang). Low side to B-.	455KC (400~Mod.)	Point of non-interference	Across voice coil.	A1, A2, A3, A4	Adjust for maximum output. If isolation transformer is not used, reduce dummy antenna to .001MFD to reduce hum modulation.
2.		Loop	1660KC	1660KC	"	A5	Fashion loop of several turns of wire and radiate signal into loop of receiver. Adjust for maximum output.
3.		"	1400KC	1400KC	"	A6	"

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PARTS LIST AND DESCRIPTIONS

AIRLINE
Model GSE-1606A

TUBES (SYLVANIA, GENERAL ELECTRIC, WESTINGHOUSE)

ITEM No.	USE	REPLACEMENT DATA		RETMA BASE TYPE	NOTES
		AIRLINE PART No.	STANDARD REPLACEMENT		
V1	Converter	12BE6	12BE6	7CH	
V2	IF Amp.	12BA6	12BA6	7BK	
V3	Det. -AVC-AF Amp.	12AV6	12AV6	7BT	
V4	Audio Output	50C5	50C5	7CV	
V5	Rectifier	35W4	35W4	5BQ	

CAPACITORS

Capacity values given in the rating column are in mfd. for Electrolytic and Paper Capacitors, and in mmfd. for Mica and Ceramic Capacitors.

ITEM No.	RATING		REPLACEMENT DATA						
	CAP.	VOLT	AIRLINE PART No.	CENTRALAB PART No.	ERIE PART No.	MALLORY PART No.	PYRAMID PART No.	SANGAMO PART No.	
C1A	50	150	MW25E24			TCD49	TD-D50-150	MTD-1550	
B	50	150							
C2	220		MW23E4000-21	D6-221	811-221			KR-1322	
C3	.047	200		DF-503		PT4147	IMP4-S47	3304147	
C4	220		MW23E4000-21	D6-221	811-221			KR-1322	
C5	.01	400		D6-103	GP3-333-103	PT411	IMP4-S1	330411	
C6A	10000								
B	250		♦MW23E2041-7	♦PC81	♦1404-02				
C									
C7	.01	400		D6-103	GP3-333-103	PT411	IMP4-S1	330411	
C8	.047	400		DF-503		PT4147	IMP4-S47	3304147	

♦ Items C6A, C6B, C6C, R6A and R6B are combined in one unit. When replacing items separately, C6B and C6C should total 250MMF.

CONTROLS

ITEM No.	RATING		REPLACEMENT DATA					INSTALLATION NOTES
	RESISTANCE	WATTS	AIRLINE PART No.	IRC PART No.	CLAROSTAT PART No.	CENTRALAB PART No.	MALLORY PART No.	
R1A	500KΩ	½	MW28E82	Q13-133	A47-500K-Z	BSK-60-S	U-48	Volume
B	Shaft		Not Req.	Not Req.	KSS-3	Not Req.	Not Req.	Attach to R1A
C	Switch		Not Req.	76-1	SWE-12	Not Req.	US-26	Attach to R1B

RESISTORS

ITEM No.	RATING		REPLACEMENT DATA		NOTES
	OHMS	WATT	AIRLINE PART No.	IRC PART No.	
R2	1.2Meg	½		BTS-1.2Meg	
R3	22KΩ	½		BTS-22K	
R4	3.3Meg	½		BTS-3.3Meg	
R5	3.3Meg	½		BTS-3.3Meg	

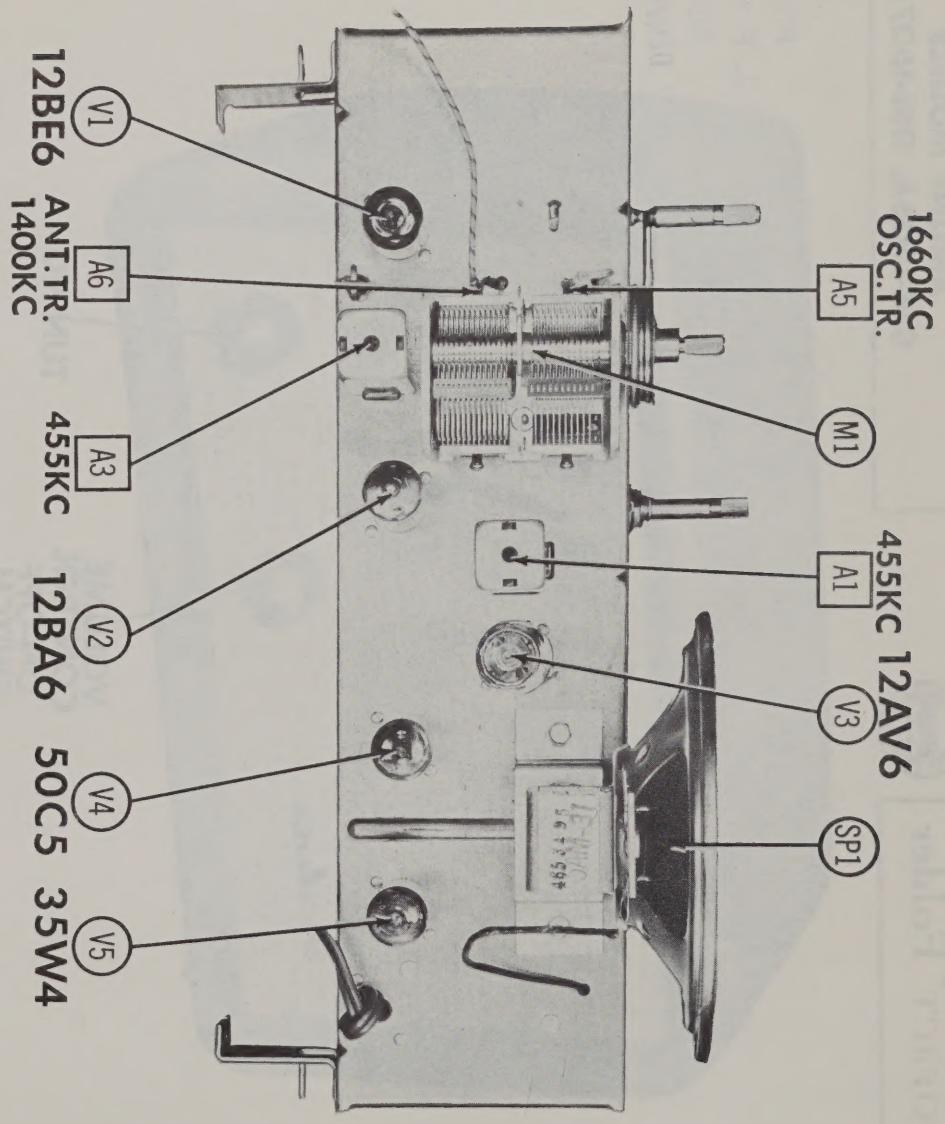
ITEM No.	RATING		REPLACEMENT DATA		NOTES
	OHMS	WATT	AIRLINE PART No.	IRC PART No.	
R6A	250KΩ	½	♦MW23E2041-7	BTS-270K	
B	500KΩ	½		BTS-560K	
R7	150Ω	½		BTS-150	
R8	2200Ω	2		BTB-2200	
R9	33Ω	½		BTS-33	

♦ Items C6A, C6B, C6C, R6A, R6B are combined in one unit.

TRANSFORMER (AUDIO OUTPUT)

ITEM No.	IMPEDANCE		REPLACEMENT DATA						NOTES
	PRI.	SEC.	AIRLINE PART No.	Halldorson PART No.	Merit PART No.	Stancor PART No.	Thordarson PART No.	Triad PART No.	
T1	2.4KΩ	3.8Ω	MW22E49-3	Z1102①	A-3031①	A-3330①	24S50A①	S-16X	① Drill one new mounting hole.

CHASSIS—TOP VIEW



PARTS LIST AND DESCRIPTIONS (Continued)

SPEAKER

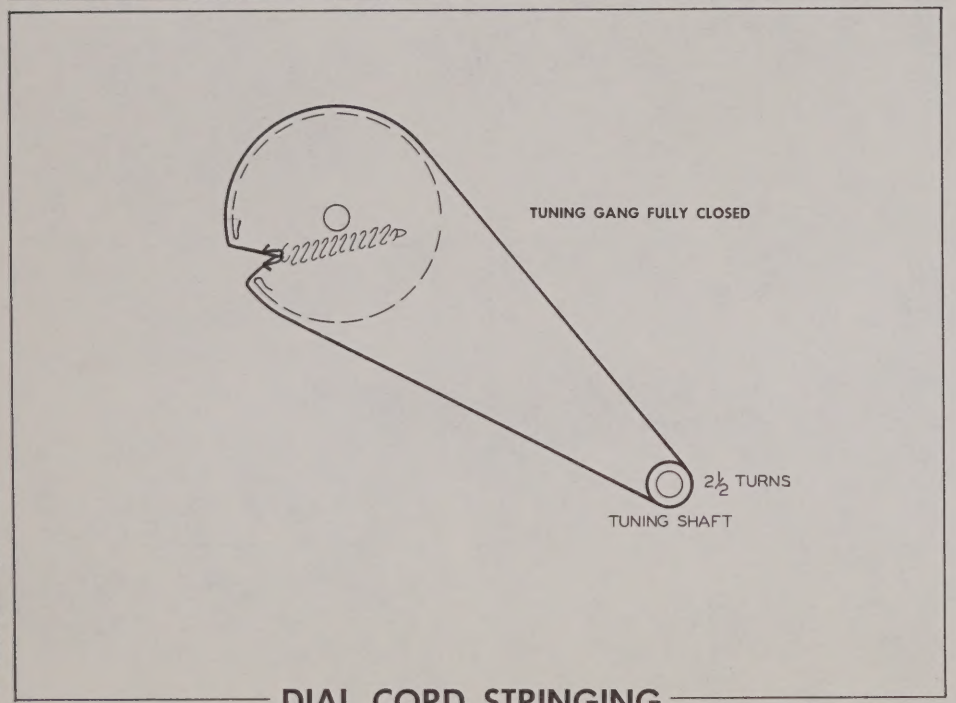
ITEM No.	RATINGS			REPLACEMENT DATA		NOTES
	SIZE	FIELD	V. C. IMP.	AIRLINE PART No.	QUAM PART No.	
SP1	5"	PM	3.8Ω	MW1E50	5A1	

COILS (RF-IF)

ITEM No.	USE	DC RES.		REPLACEMENT DATA				NOTES
		PRI.	SEC.	AIRLINE PART No.	MEISSNER PART No.	MERIT PART No.	MILLER PART No.	
L1	Loop antenna	3Ω		MW7E308				Includes cabinet back.
L2	Osc. coil	.9Ω	8.5Ω	MW20E733	14-1073		69-Osc.	Drill mounting hole.
L3	Input IF	15Ω	15Ω	MW20E732	16-6758	BC-352	12-C1	
L4	Output IF	15Ω	15Ω	MW20E732	16-6758	BC-353	12-C2	
L5	Chassis Isolation	0Ω		MW20E833				Wound on .1MFD cap.

MISCELLANEOUS

ITEM No.	PART NAME	AIRLINE PART No.	NOTES
M1	Tuning Cap.	MW24E58	2 Gang (31-462MMF, 28-162MMF)
	Cabinet	MW7E306-2	Green
	Cabinet	MW7E306-3	White
	Knob	MW37E91-3	Tuning & On-Off-Volume
	Dial Pointer	MW35E39	
	Dial	MW36E103	

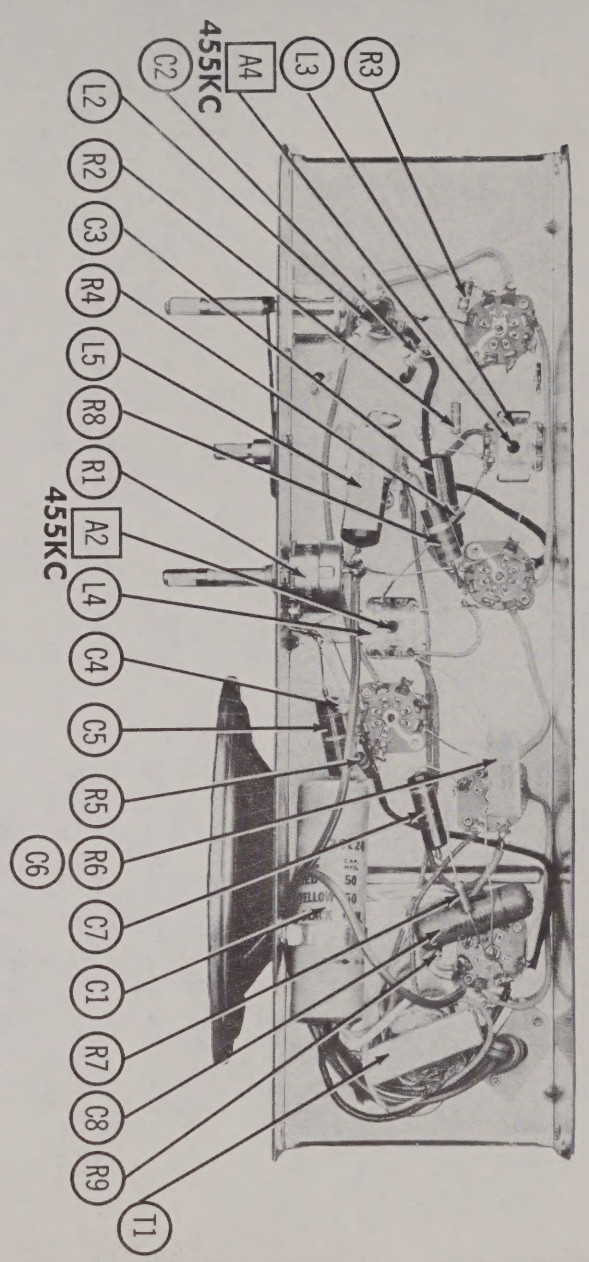


DIAL CORD STRINGING

SET 292 FOLDER 2

AIRLINE
Model GSE-1606A

CHASSIS—BOTTOM VIEW



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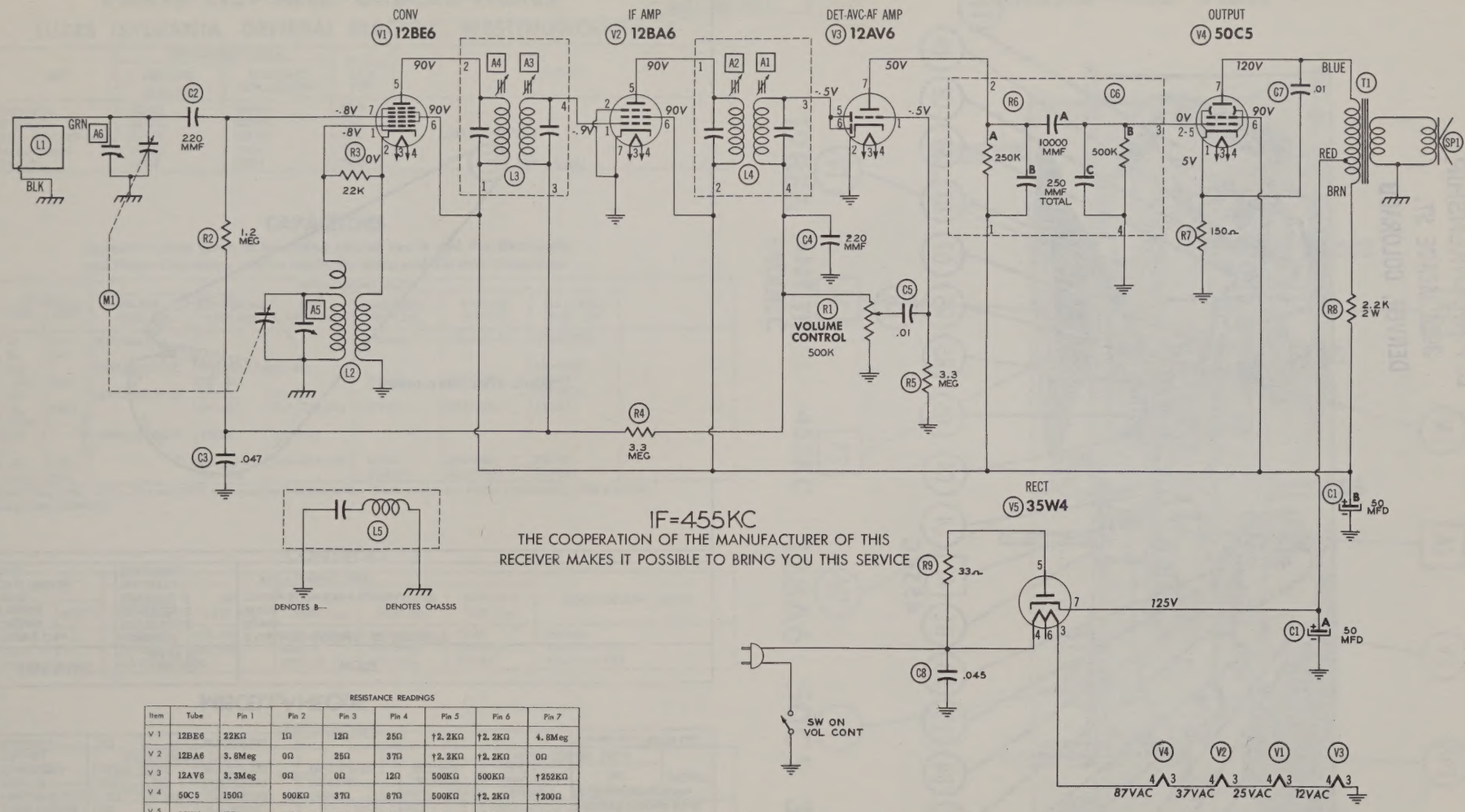
AIRLINE
Model GSE-1606A



IF=455KC

THE COOPERATION OF THE MANUFACTURER OF THIS RECEIVER MAKES IT POSSIBLE TO BRING YOU THIS SERVICE

RESISTANCE READINGS

Item	Tube	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7
V 1	12BE6	22KΩ	1Ω	12Ω	25Ω	†2.2KΩ	†2.2KΩ	4.8Meg
V 2	12BA6	3.8Meg	0Ω	25Ω	37Ω	†2.2KΩ	†2.2KΩ	0Ω
V 3	12AV6	3.3Meg	0Ω	0Ω	12Ω	500KΩ	500KΩ	†252KΩ
V 4	50C5	150Ω	500KΩ	37Ω	87Ω	500KΩ	†2.2KΩ	†200Ω
V 5	35W4	TP	TP	87Ω	117Ω	150Ω	112Ω	50KΩ

†MEASURED FROM PIN 7 OF V5.
TP-TIE POINT.

1. DC voltage measurements taken with vacuum tube voltmeter; AC voltages measured at 1000 ohms per volt.
2. Socket connections are shown as bottom views.
3. Measured values are from socket pin to common negative.
4. Line voltage maintained at 117 volts for voltage readings.
5. Nominal tolerance on component values makes possible a variation of ± 15% in voltage and resistance readings.
6. Volume control at maximum, no signal applied for voltage measurements.

A PHOTOFACT STANDARD NOTATION SCHEMATIC

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PHOTOFACT* Folder

CBS-COLUMBIA MODELS 23C49L, LB, S, SB, SM, 23C59, B (Ch. 921-94)

IMPORTANT FILING NOTICE

The contents for this envelope will be found among the last folders in this complete set of folders . . . *unless* it has been purchased as part of a *complete* volume of PHOTOFACTS assembled in a DeLuxe Binder.

Merely insert the corresponding folder on this model in this envelope to retain proper filing and indexing order.

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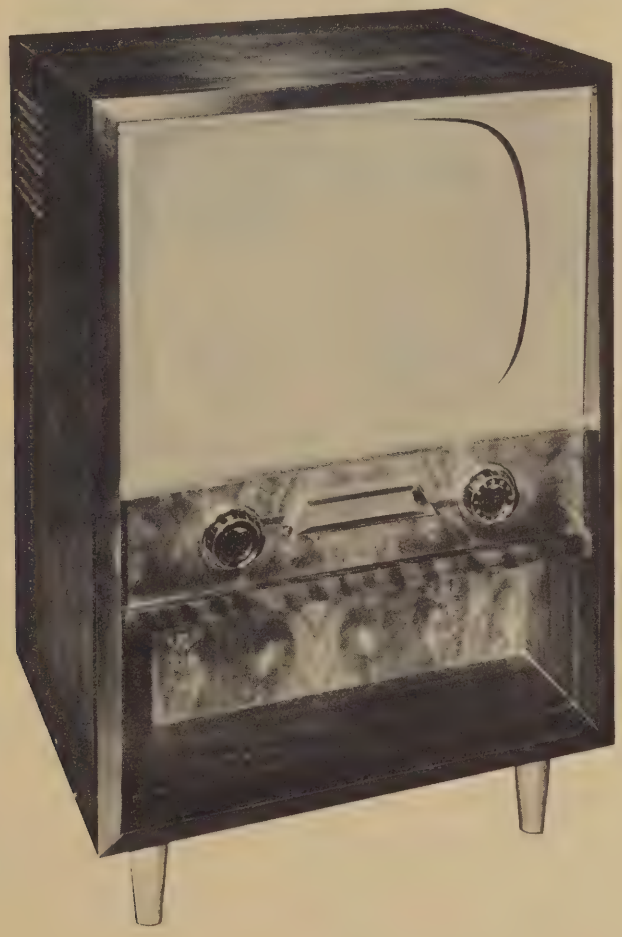

MODEL 23C49SM

CBS-COLUMBIA MODELS 23C49L, LB, S, SB, SM, 23C59, B (Ch. 921-94)

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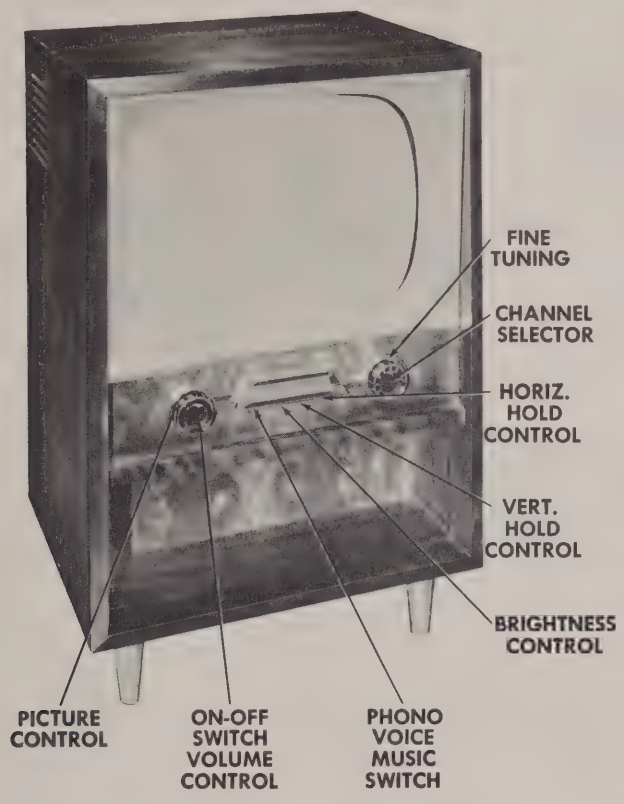
DATE 10–55 SET 292 FOLDER 3



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DENVER, COLORADO

CBS-COLUMBIA MODELS 23C49L,
LB, S, SB, SM, 23C59, B (Ch. 921-94)

CBS-COLUMBIA MODEL 23C49SM

TRADE NAME	CBS-Columbia Models 23C49L, 23C49LB, 23C49S, 23C49SB, 23C49SM, 23C59, 23C59B (Ch. 921-94)
MANUFACTURER	CBS-Columbia, A Division of Columbia Broadcasting System, Inc., 48-50 34th. St., Long Island City, N.Y.
TYPE SET	Television Receiver
TUBES	Twenty-one
POWER SUPPLY	110-120 Volts AC-60 Cycles RATING 1.72 Amp. @ 117 Volts AC
TUNING RANGE—	Channels 2 thru 13, Video IF 45.75MC, Sound IF 41.25MC (Intercarrier)

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Tube Placement Chart (Top View) 5

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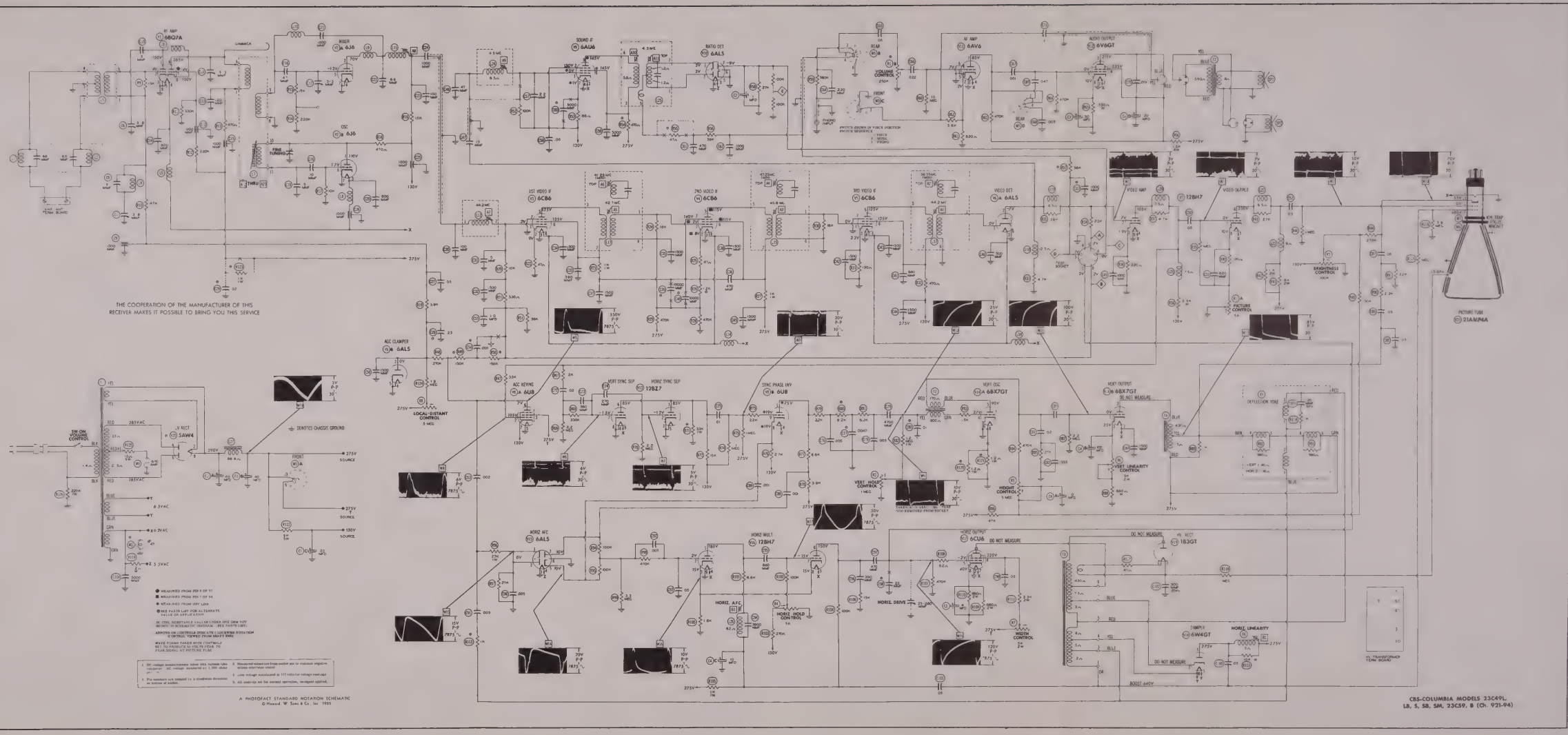
THE COOPERATION OF THE MANUFACTURER OF THIS RECEIVER MAKES IT POSSIBLE TO BRING YOU THIS SERVICE
CBS-COLUMBIA MODELS 23C49L, LB, S, SB, SM, 23C59, B (Ch. 921-94)
A PHOTOFACT STANDARD NOTATION SCHEMATIC
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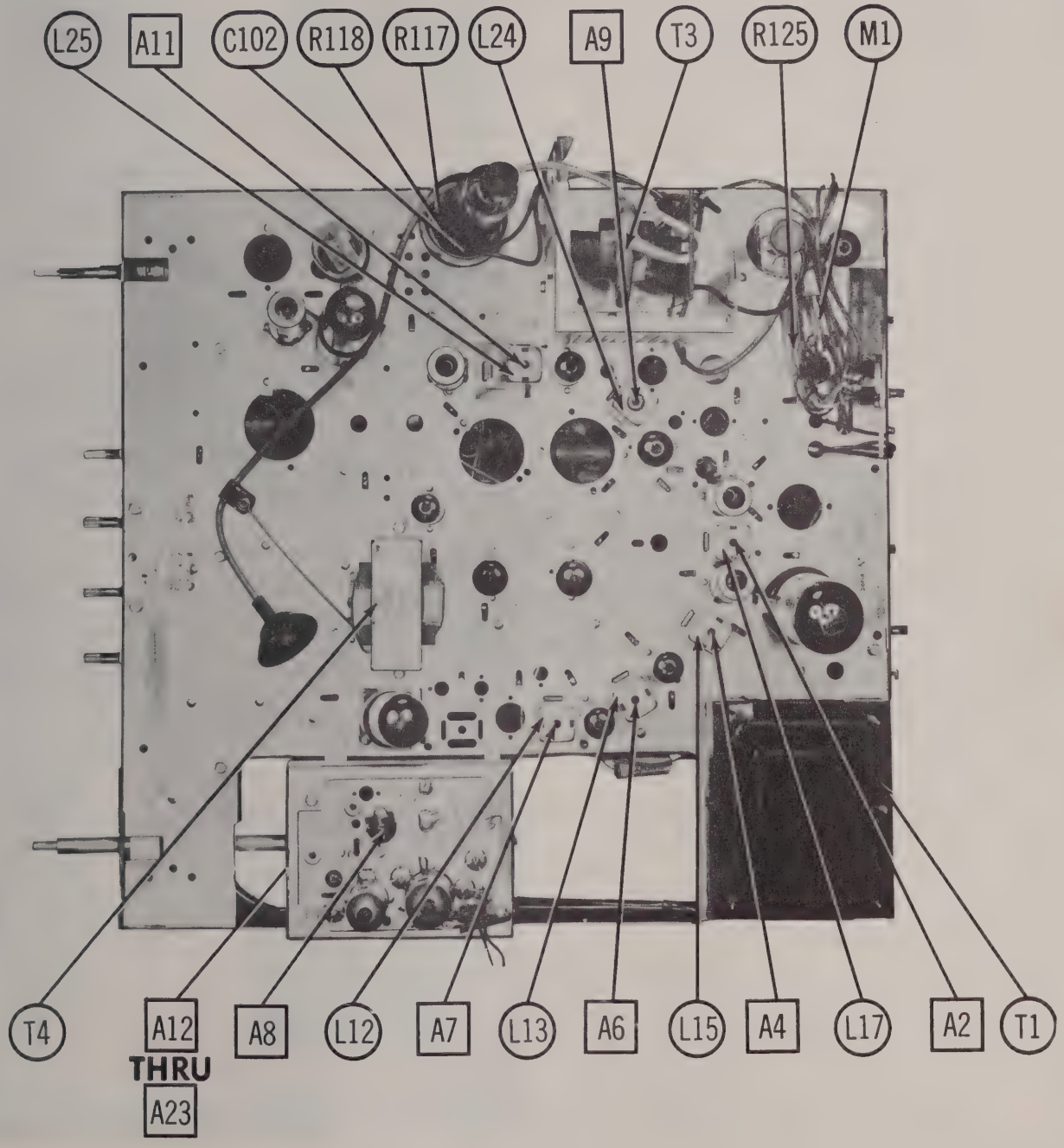
3924 MEADE ST.
DENVER, COLORADO



CHASSIS TOP VIEW

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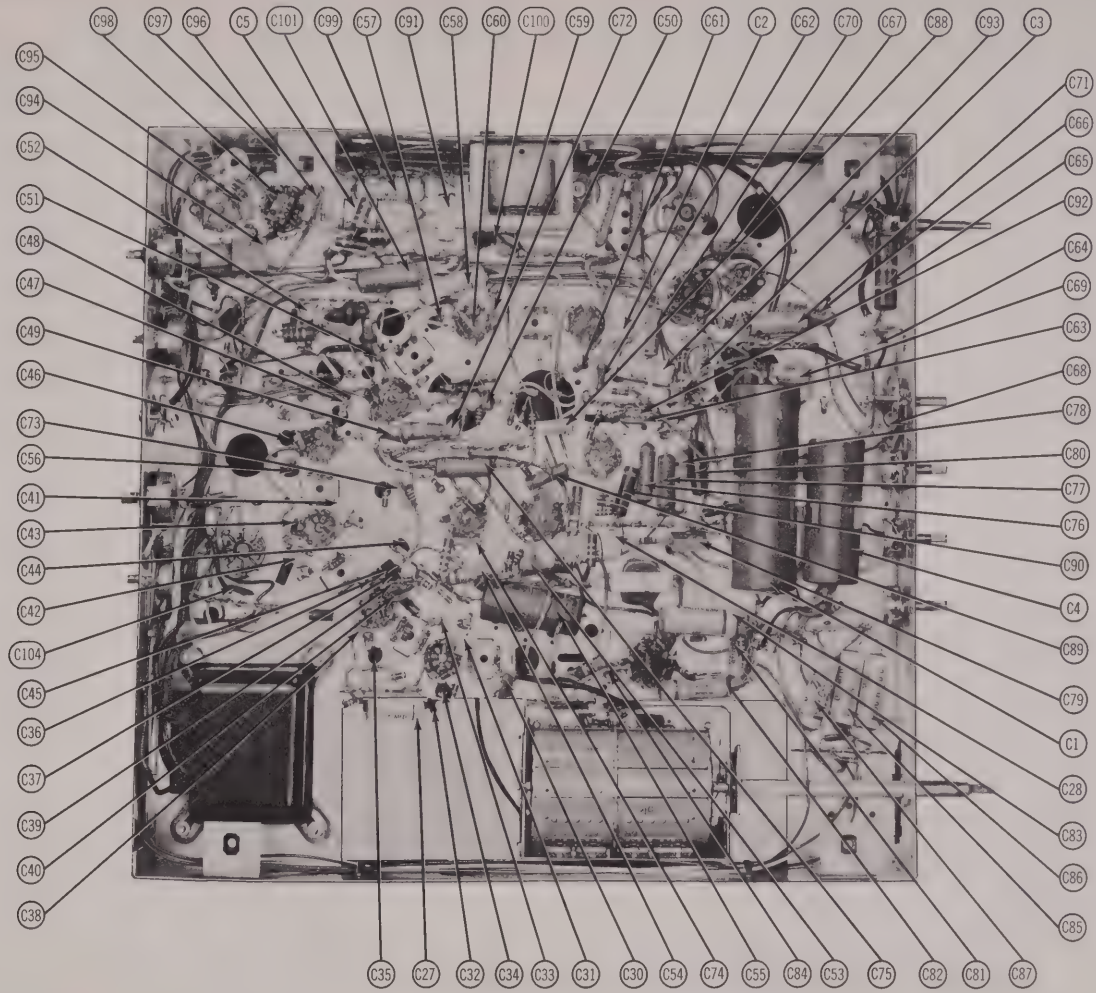
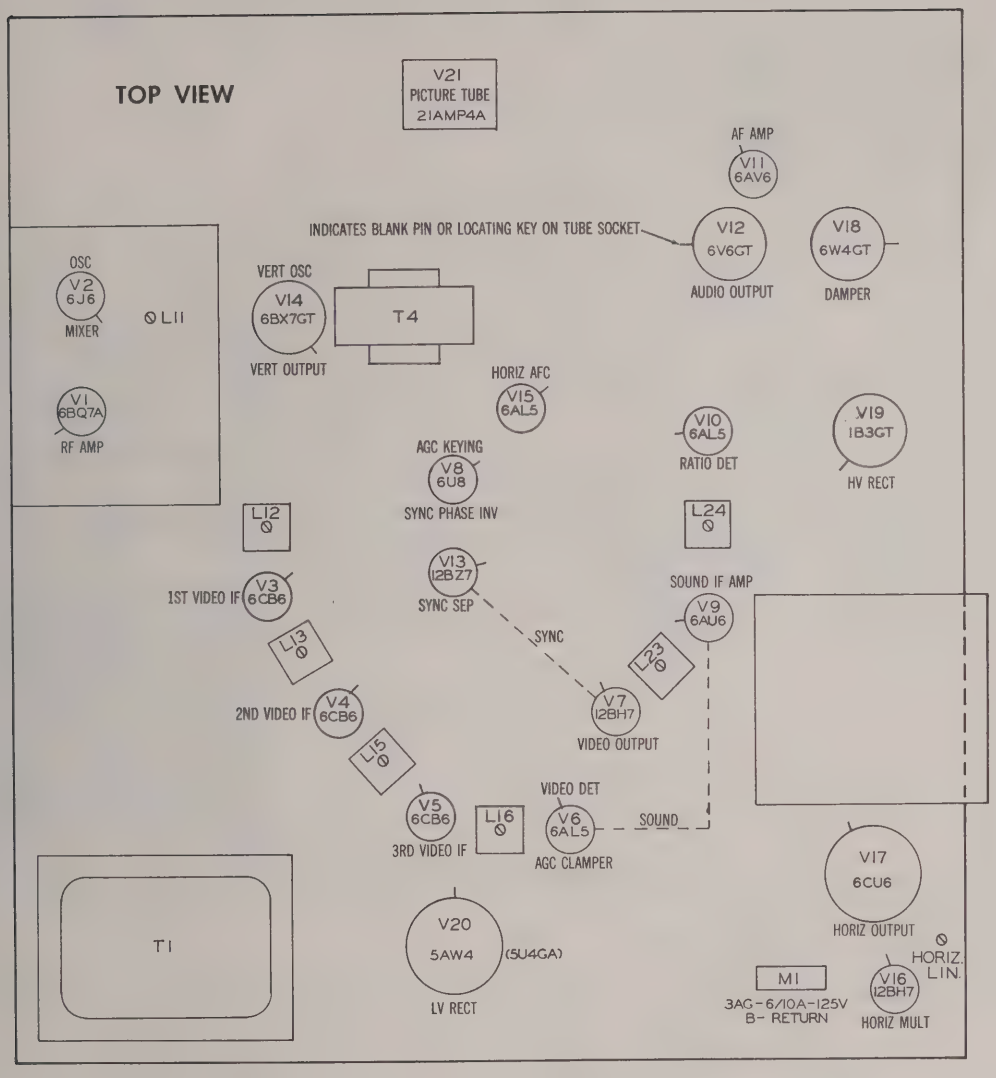


CHASSIS BOTTOM VIEW-CAPACITOR IDENTIFICATION

TUBE PLACEMENT CHART



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TUBE FAILURE CHECK CHART

The following chart lists tubes whose failures are most likely to produce the indicated symptoms. Refer to tube placement chart for location and type of tube.

POWER SUPPLY FAILURE
No raster, no sound - **V20, Fuse (M1)**

LOSS OF PICTURE OR SOUND
No pic, no sound, has raster - **V2, V3, V4, V5, V6**
No pic, no sound, has snow - **V1, V2, V3**
No pic, has sound, has raster - **V6, V7, V21**
Has pic, no sound - **V9, V10, V11, V12**
Overloaded picture - **V6, V8**

SYNC FAILURE
No vert. sync - **V8, V14**
No horiz. sync - **V8, V15, V16**
No vert. or horiz. sync - **V8, V13**

SWEEP FAILURE
No raster, has sound - **V16, V17, V18, V19, V21**
No vertical deflection - **V14**
Poor vert. linearity or foldover - **V14**
Poor horiz. linearity or foldover - **V16, V17, V18**
Narrow picture - **V16, V17, V18, V19, V20**
Vert. off freq. - **V8, V14**
Horiz. off freq. - **V8, V15, V16**

ALIGNMENT INSTRUCTIONS

ALIGNMENT INSTRUCTIONS—READ CAREFULLY BEFORE ATTEMPTING ALIGNMENT

The high voltage shock hazard may be eliminated by removing the horizontal output tube (V17) from its socket.

VIDEO IF ALIGNMENT

Remove the converter tube (V2) from its socket and replace with a 6J6 which has pin 1 removed. This will disable the local oscillator and reduce the possibility of erroneous indications.
Attenuate generator output to maintain 3 volts at VTVM.
Connect negative lead of a 3 volt bias supply to point (B).
Connect positive lead to chassis.

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	CHANNEL	CONNECT VTVM	ADJUST	REMARKS
1.	Direct	High side to an ungrounded tube shield floating over dummy converter tube. Low side to chassis.	44.2MC (Unmod)	Any	DC probe to point (A). Common to chassis.	A1	Adjust for maximum deflection.
2.	"	"	39.75MC	"	"	A2	Adjust for MINIMUM deflection.
3.	"	"	45.6MC	"	"	A3	Adjust for maximum deflection.
4.	"	"	47.25MC	"	"	A4	Adjust for MINIMUM deflection.
5.	"	"	42.7MC	"	"	A5	Adjust for maximum deflection.
6.	"	"	41.25MC	"	"	A6	Adjust for MINIMUM deflection.
7.	"	"	44.2MC	"	"	A7	Detune A8 by turning adjustment (A8) counter clockwise. Adjust A7 for maximum deflection.

OVERALL VIDEO IF RESPONSE CHECK

Attenuate sweep generator output to maintain 3 volts peak to peak vertical deflection on scope.
Connect the synchronized sweep voltage from the sweep generator to the horizontal input of the oscilloscope for horizontal deflection.

	DUMMY ANTENNA	SWEEP GENERATOR COUPLING	SWEEP GENERATOR FREQUENCY	MARKER GENERATOR FREQUENCY	CHANNEL	CONNECT SCOPE	ADJUST	REMARKS
8.	Direct	High side to an ungrounded tube shield floating over dummy converter tube. Low side to chassis.	43.5MC (10MC Swp)	39.75MC 41.25MC 42.5MC 45.75MC 47.25MC	Any	Vert. Amp. to point (A). Low side to chassis.		If separate marker generator is used couple it loosely to sweep generator output. Check for response curve for similar to Fig. 1. Adjust A8 for maximum amplitude and correct band width, with correct position of 45.75MC marker. If necessary, retouch SLIGHTLY A1 thru A7 for desired response. A7 affects bandwidth. A1 affects tilt and bandwidth. A3 places 45.75MC marker. A5 places 42.5MC marker. Increase sweep generator output to observe trap marker positions. If necessary SLIGHTLY retouch A2 for 39.75MC marker, A4 for 47.25MC marker and A6 for 41.25MC marker. If A2, A4 or A6 adjustments are retouched, check response curve (Fig. 1) again.

SOUND IF ALIGNMENT USING AM SIGNAL GENERATOR AND VTVM

Connect two matched 100KΩ (±1%) resistors in series from point (C) to chassis. The junction of these two resistors is alignment point (E) as shown on the schematic.

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	CHANNEL	CONNECT VTVM	ADJUST	REMARKS
9.	.001MFD	High side to point (A). Low side to chassis.	4.5MC (Unmod)	Any	DC probe to point (C). Common to chassis.	A9, A10	Adjust for maximum deflection. Attenuate generator output to maintain less than 10 volts at VTVM.
10.	"	"	"	"	DC probe to point (D). Common to point (E).	A-11	Adjust for zero reading. A positive and negative reading will be obtained on either side of the correct setting.

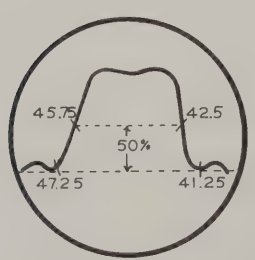

FIG. 1

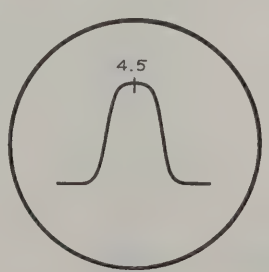

FIG. 2

ALIGNMENT INSTRUCTIONS (cont)

SOUND IF ALIGNMENT USING FM SIGNAL GENERATOR AND OSCILLOSCOPE

Use frequency modulated signal with 60∿ modulation and 450KC sweep. Use 120∿ sawtooth voltage in scope for horizontal deflection.

	DUMMY ANTENNA	SWEEP GENERATOR COUPLING	SWEEP GENERATOR FREQUENCY	MARKER GENERATOR FREQUENCY	CHANNEL	CONNECT SCOPE	ADJUST	REMARKS
9.	.001MFD	High side to point Ⓐ. Low side to chassis.	4.5MC (450KC Swp)	4.5MC	Any	Vert. Amp. to point Ⓒ. Low side to chassis.	A9, A10	Disconnect stabilizing capacitor C2. Adjust for curve of maximum amplitude and symmetry similar to Fig. 2.
10.	"	"	"	"	"	Vert. Amp. to point Ⓓ. Low side to chassis.	A-11	Reconnect stabilizing capacitor C2. Adjust so that 4.5MC occurs at center of crossover lines as in Fig. 3. SLIGHTLY retouch A10 for maximum amplitude and straightness of crossover lines.

VHF OSCILLATOR ALIGNMENT

Remove the dummy converter tube and replace the orginal 6J6 in its socket. Connect the bias supply as under "Video IF Alignment."
The channel oscillator adjustment screws are reached through a hole just to the right of the channel switch shaft. The correct adjustment screw is accessible through this hole as the channel switch is turned to each channel.
Connect the synchronized sweep voltage from the sweep generator to the horizontal input of the oscilloscope for horizontal deflection.
The sweep generator output lead should be terminated with its characteristic impedance, usually 50 ohms.
Set the fine tuning control to the mid-position of its range.

	DUMMY ANTENNA	SWEEP GENERATOR COUPLING	SWEEP GENERATOR FREQUENCY	MARKER GENERATOR FREQUENCY	CHANNEL	CONNECT SCOPE	ADJUST	REMARKS
11.	Two 120Ω Carbon Resistors	Across antenna terminals with 120Ω in each lead.	207MC (10MC Swp)	205.25MC 209.75MC	12	Vert. Amp. to point Ⓐ. Low side to chassis.	A12	Advance scope gain so that the sound trap notch is visible on response curve. Adjust to place sound marker in trap notch. Video marker should fall at 50% on opposite slope of response curve as in Fig. 4.
			213MC (10MC Swp)	211.25MC 215.75MC	13		A13	
			201MC (10MC Swp)	199.25MC 203.75MC	11		A14	
			195MC (10MC Swp)	193.25MC 197.75MC	10		A15	
			189MC (10MC Swp)	187.25MC 191.75MC	9		A16	
			183MC (10MC Swp)	181.25MC 185.75MC	8		A17	
			177MC (10MC Swp)	175.25MC 179.75MC	7		A18	
			85MC (10MC Swp)	83.25MC 87.75MC	6		A19	
			79MC (10MC Swp)	77.25MC 81.75MC	5		A20	
			69MC (10MC Swp)	67.25MC 71.75MC	4		A21	
			63MC (10MC Swp)	61.25MC 65.75MC	3		A22	
			57MC (10MC Swp)	55.25MC 59.75MC	2		A23	

VHF RF AND MIXER ALIGNMENT

The RF and mixer portion of the tuner has been properly aligned at the factory and is very stable. Alignment of this portion is not recommended in the field.

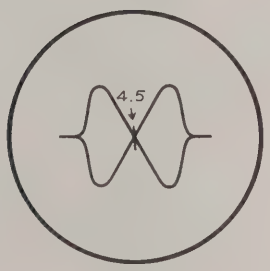

FIG. 3

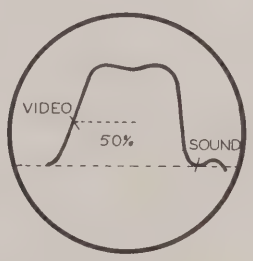

FIG. 4

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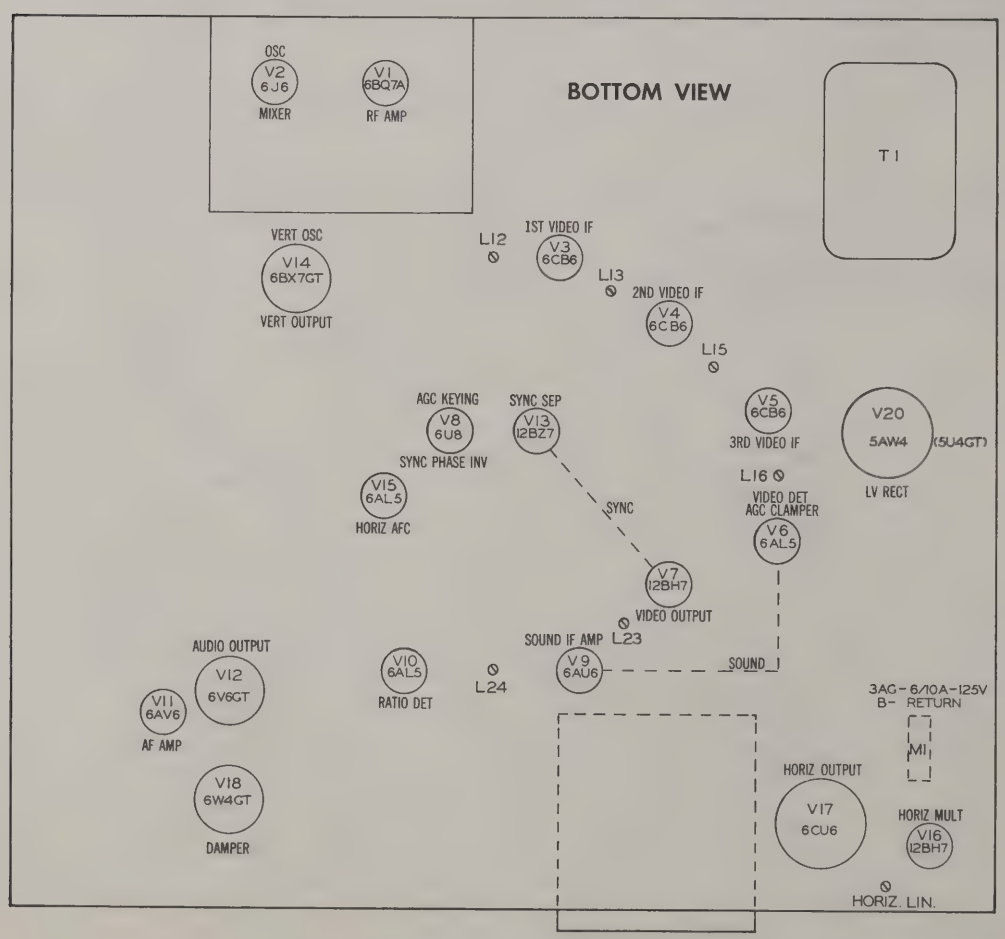
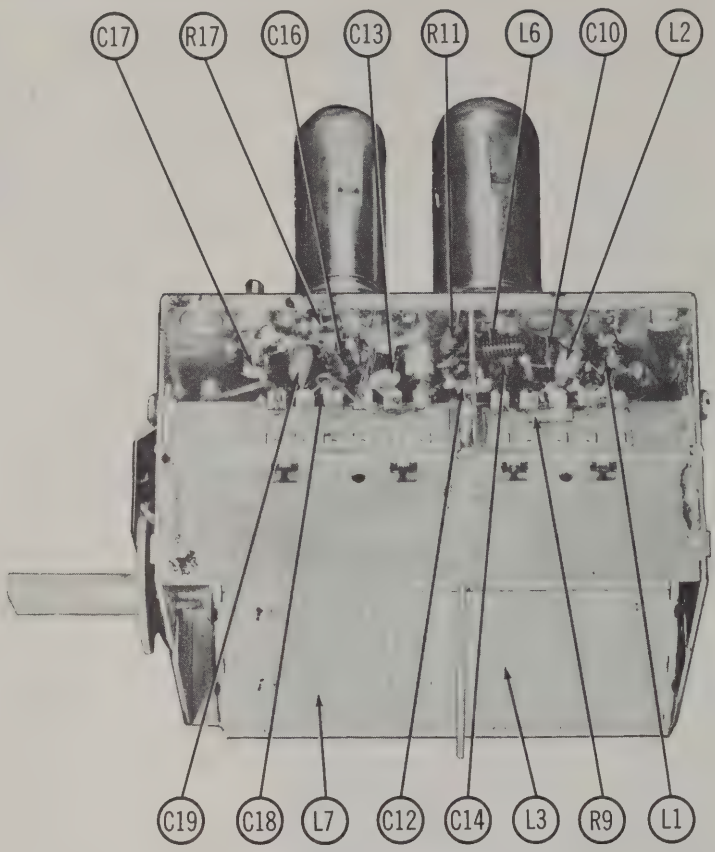
RESISTANCE MEASUREMENTS

Item	Tube	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8	Pin 9
V 1	6BQ7A	INF	550KΩ	0Ω	.1Ω	0Ω	†600Ω	140KΩ	INF	0Ω
V 2	6J6	■470Ω	■15KΩ	.1Ω	0Ω	235KΩ	10KΩ	0Ω		
V 3	6CB6	60KΩ	47Ω	0Ω	.1Ω	▲1KΩ	▲1KΩ	0Ω		
V 4	6CB6	270KΩ	▲47Ω	0Ω	.1Ω	†1KΩ	†1KΩ	270KΩ		
V 5	6CB6	.1Ω	150Ω	.1Ω	0Ω	■500Ω	■500Ω	0Ω		
V 6	6AL5	.3Ω	500KΩ	.1Ω	0Ω	0Ω	0Ω	4.7KΩ		
V 7	12BH7	■3.3KΩ	4.7KΩ	220Ω	.1Ω	.1Ω	†7KΩ	1Meg	1.7KΩ	0Ω
V 8	6U8	†11KΩ	■36KΩ	†70Ω	.1Ω	0Ω	350KΩ	25KΩ	30KΩ	550KΩ
V 9	6AU6	130KΩ	25KΩ	.1Ω	0Ω	†500Ω	†500Ω	▲68Ω		
V 10	6AL5	INF	INF	.1Ω	0Ω	0Ω	0Ω	27KΩ		
V 11	6AV6	10Meg	820Ω	0Ω	.1Ω	0Ω	0Ω	†470KΩ		
V 12	6V6GT	NC	.1Ω	†2.1KΩ	†1.5KΩ	470KΩ	NC	0Ω	330Ω	
V 13	12BZ7	■15KΩ	2.2Meg	0Ω	0Ω	0Ω	■15KΩ	2.5Meg	0Ω	.1Ω
V 14	6BX7GT	2.2Meg	†500Ω	1.1KΩ	1.8Meg	†1.5Meg	0Ω	.1Ω	.3Ω	
V 15	6AL5	27KΩ	27KΩ	0Ω	.1Ω	3.5Meg	0Ω	3.5Meg		
V 16	12BH7	†7KΩ	4Meg	1.8KΩ	.1Ω	.1Ω	†100KΩ	120KΩ	1.8KΩ	0Ω
V 17	6CU6	TP	0Ω	TP	†4KΩ	470KΩ	TP	.1Ω	340Ω	TOP CAP ▲7.5Ω
V 18	6W4GT	NC	NC	5Meg	NC	†75Ω	NC	5Meg	5Meg	
V 19	1B3GT		PINS	1 - 8	HAVE	INF	RESISTANCE			TOP CAP ▲440Ω
V 20	5AW4	NC	30KΩ	NC	36Ω	NC	36Ω	NC	30KΩ	
V 21	21AMP4	0Ω	1Meg	PIN 10 ▲1Meg	PIN 11 ■320KΩ	PIN 12 .1Ω				

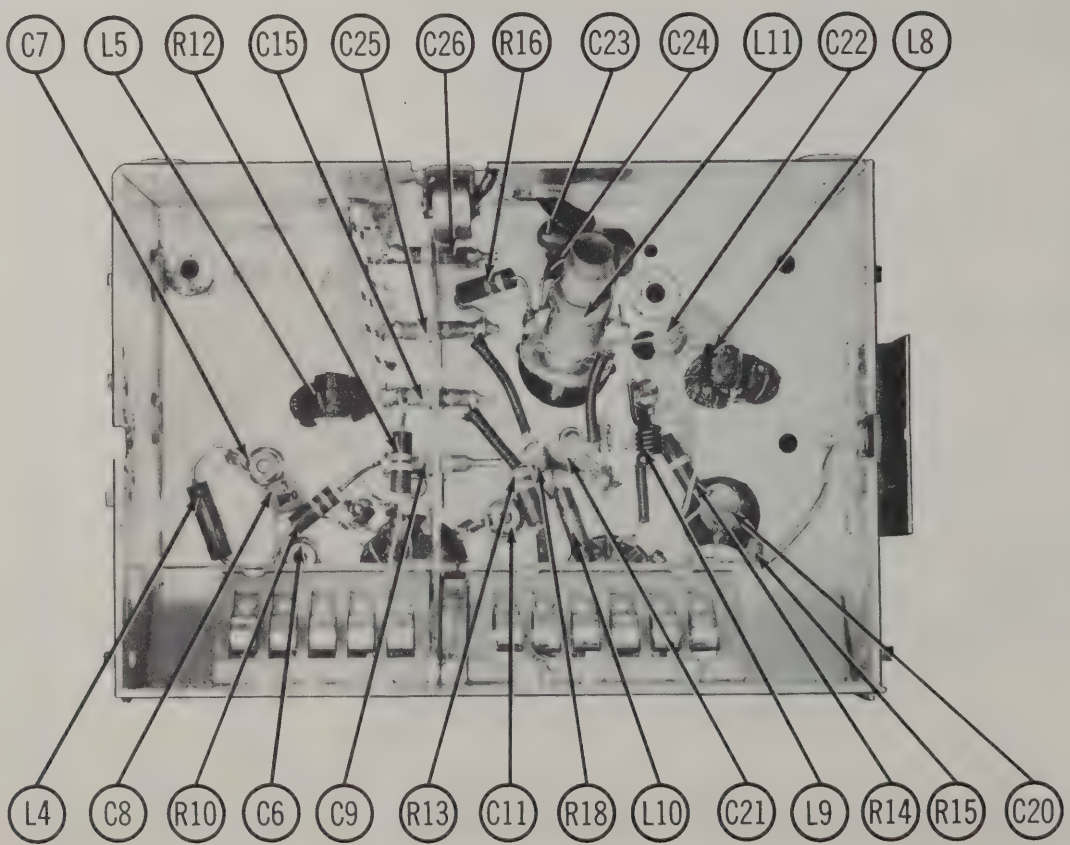
† MEASURED FROM PIN 8 OF V20.
■ MEASURED FROM 130V SOURCE.
▲ MEASURED FROM PIN 7 OF V4.
▲ MEASURED FROM PIN 3 OF V18.
NC - NO CONNECTION
TP - TIE POINT



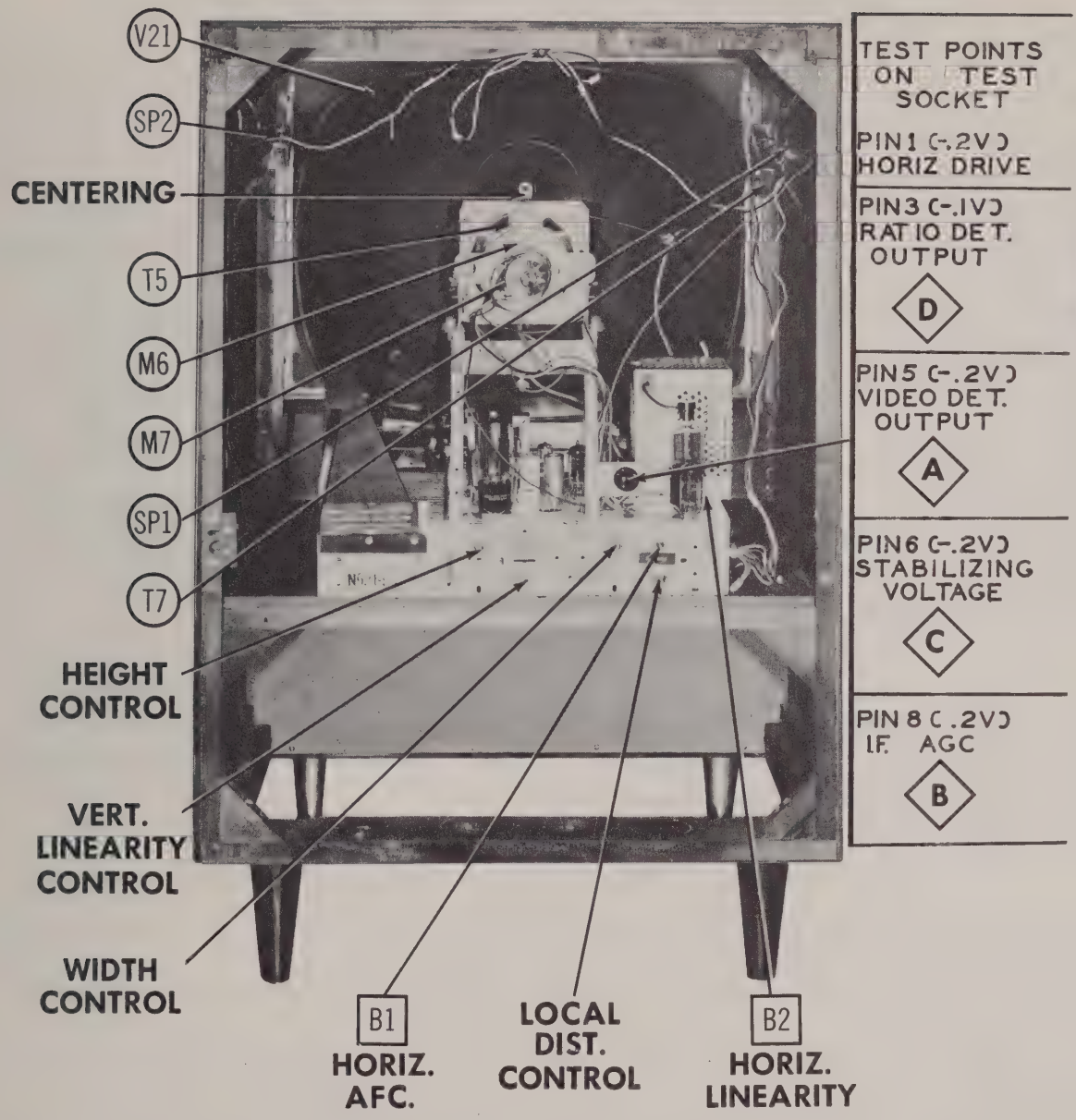
TUBE PLACEMENT CHART



RF TUNER-RIGHT SIDE



RF TUNER-BOTTOM VIEW



CABINET—REAR VIEW

HORIZONTAL SWEEP CIRCUIT ADJUSTMENTS

Turn the set on and tune in a TV station, preferably a test pattern.

Set the horizontal hold control to its mid-range position and adjust the horizontal AFC slug (B1) until the picture synchronizes horizontally.

Adjust the horizontal width control (R7) for a picture slightly wider than necessary to fill the picture mask horizontally.

Adjust the horizontal linearity slug (B2) for a picture that is symmetrical from left to right.

TROUBLE SHOOTING AIDS

SWEEP

HORIZONTAL

LOSS OF SWEEP

Follow procedure outlined under "Loss of High Voltage".

INSUFFICIENT SWEEP

Check by substitution V17, V18 and V20. Check adjustments R7 and B2. Check C97, C98, R109, R110, R111, T3, T5A and other associated components.

DRIVE LINES

Check by substitution V17 and V18. Check C97, C98, R104, R111, T3, T5A and other associated components.

COMPRESSED LEFT SIDE

Check by substitution V17 and V18. Check horizontal output and damper stages for component failure or change of value.

FOLDS

Follow procedure outlined under "Drive Lines".

PIE CRUST EFFECT

Check by substitution V16, V17, and V18. Check C93 for open. Check L26, C92, R98, R101 and other associated components.

XMAS TREE EFFECT

Check by substitution V16, V17 and V18. Check T3 and T5 for internal arcing. Check L26, C94, C90, C91, R96, R97 and other associated components.

VERTICAL

LOSS OF SWEEP

Substitute V14. Check waveform W11.

If Satisfactory	If Unsatisfactory
Check T4, T5B, R89, R88, C4B and other associated components.	Check T2, C80, C83, R86, R84, R5, R82 and other associated components.

INSUFFICIENT SWEEP

Substitute V14. Check height and vertical linearity controls for proper operation. Check R84, R86, T4 and other associated components.

COMPRESSED AT BOTTOM

Substitute V14. Check R86, R84, R5, T2 and other associated components.

COMPRESSED AT TOP

Substitute V14. Check C83, C4B, R88, R6, T4 and other associated components.

FOLDS

Substitute V14. Check C81, C82, C83, R85, T4, T5B and other associated components.

SYNC

LOSS OF VERTICAL AND HORIZONTAL SYNC

Check by substutution V13 and V8. Check C72, C73, C74, C75, R72, R77, R78 and other associated components.

LOSS OF HORIZONTAL SYNC - VERTICAL SYNC SATISFACTORY

Check by substitution V15 and V16. Check L26, C88, C92, C93, C95, R98, R100 and other associated components.

HORIZONTAL BENDING

Check by substitution V8, V13, V15 and V16. Check horizontal AFC network.

VIDEO

LOSS OF VIDEO

Substitute V7. Check C50, C52, R38, R42, R43, L21, L23 and other associated components.

SOUND BARS (4.5 BEAT)

Adjust tuner fine tuning for best sound and picture. Check video IF alignment.

POOR CONTRAST

Substitute V7. Check C50, C52, L20, L22, R41, R37, R42, R43 and other associated components.

NEGATIVE PICTURE

Substitute V7. Check picture tube. Check C50, C52, L18, L19 and other associated components.

SMEAR

Substitute V7. Check video detector network. Check L18, L19, L20, L22, C50, C52 and other associated components.

WIDE BLACK BAR ACROSS PICTURE

Check by substitution V1, V3, V4, V5, V6 and V7 for heater to cathode leakage.

AUDIO

WEAK OR NO SOUND

Check by substitution V9, V10, V11 and V12. Check stages V11 and V12 using audio signal generator. Apply audio signal across R1B.

If Satisfactory	If Unsatisfactory
Check ratio detector and audio IF stages for component failure or change of value.	Check C65, C66, C67, C70, C1D, C3, R63, R65, R66, T7, speaker and other associated components.

BUZZ

Adjust tuner fine tuning for best sound and picture. Check adjustment A11 for minimum buzz. If still unsatisfactory. Check audio IF alignment.

DISTORTED

Follow procedure outlined under "Weak or no Sound."

POWER

DEAD SET

If filaments fail to light, check AC interlock assembly. Check switch on volume control and T1. If filaments light, substitute V20. Check B+ filter and decoupling network.

SMALL AND/OR DIM PICTURE

Substitute V20. Check B+ filter and decoupling network.

PARTS LIST AND DESCRIPTIONS

TUBES (SYLVANIA, GENERAL ELECTRIC, WESTINGHOUSE)

ITEM No.	USE	REPLACEMENT DATA		RETMA BASE TYPE	NOTES
		CBS-Columbia PART No.	STANDARD REPLACEMENT		
V1	RF Amp.	6BQ7A	6BQ7A	9AJ	
V2	Mixer-Osc.	6J6	6J6	7BF	
V3	1st Video IF Amp.	6CB6	6CB6	7CM	
V4	2nd Video IF Amp.	6CB6	6CB6	7CM	
V5	3rd Video IF Amp.	6CB6	6CB6	7CM	
V6	Video Det. - AGC Clamper	6AL5	6AL5	6BT	
V7	Video Amp. - Video Output	12BH7	12BH7	9A	
V8	AGC Keying- Sync Phase Inv.	6U8	6U8	9AE	
V9	Sound IF Amp.	6AU6	6AU6	7BK	
V10	Ratio Det.	6AL5	6AL5	6BT	
V11	AF Amp.	6AV6	6AV6	7BT	
V12	Audio Output	6V6GT	6V6GT	7S	
V13	Vert. Sync Sep. - Horiz. Sync Sep.	12BZ7	12BZ7	9A	
V14	Vert. Osc. - Vert. Output	6BX7GT	6BX7GT	8BD	
V15	Horiz. AFC	6AL5	6AL5	6BT	
V16	Horiz. Mult.	12BH7	12BH7	9A	
V17	Horiz. Output	6CU6	6CU6	6AM	
V18	Damper	6W4GT	6W4GT	4CG	
V19	HV Rect.	1B3GT	1B3GT	3C	
V20	LV Rect.	5AW4	5AW4	5T	5U4GA used as alternate.

CATHODE-RAY TUBE

ITEM No.	REPLACEMENT DATA					RETMA BASE TYPE	NOTES
	CBS-Columbia PART No.	CBS PART No.	GENERAL ELECTRIC PART No.	SYLVANIA PART No.	WESTINGHOUSE PART No.		
V21	21AMP4A ①	21AMP4A ① 21AMP4	21ACP4A/21AMP4A ①	21AMP4A ② 21AMP4	21AMP4A ① 21AMP4	12N 12N	① Aluminized ② Silver Screen

CAPACITORS

Capacity values given in the rating column are in mfd. for Electrolytic and Paper Capacitors, and in mmfd. for Mica and Ceramic Capacitors.

ITEM No.	RATING		REPLACEMENT DATA						NOTES
	CAP.	VOLT	CBS-Columbia PART No.	CENTRALAB PART No.	ERIE PART No.	MALLORY PART No.	PYRAMID PART No.	SANGAMO PART No.	
C1A	40	350	21000861			WQ795	TDL-D40-450	FMD-4540	
B	40	350							
C	20	350					TDL-D20-450	FMD-3520	
D	20	350							
C2	1	100	21000521			TC40	TD-4-150	MMT-1505	
C3	50	25	21000531			TC29	TD-50-25	FM-0250	
C4A	10	350	21000851			WT700	TM-3061	T-810	
B	100	50							
C	10	350							
C5	4	50	21000341			TC30	TD-4-50	MMT-0505	
C6	3-8			829-10					
C7	3-8			829-10					
C8	3			TCZ-3R3	NP0A-030	ZT-5533			
C9	1000								
C10	3			TCZ-3R3	NP0A-030	ZT-5533			
C11	.5-3			829-3	3115-01-0R5	CT565A			
C12	1000								
C13	120			DD-121	811-121	UC-5312			
C14	800			DD-801	831-801	DC-521			
C15	1000								
C16	47			DD-470	831-470	UC-5447			
C17	.5-3			829-3	3115-01-0R5	CT565A			
C18	10			TCZ-10	NP0K-100	ZT-541			
C19	5			TCN-5	N750A-050	NT-555			
C20	800			DD-801	831-801	DC-521			
C21	1000			DD-102	801-001	DC-521			
C22	6.8			TCZ-6R8	NP0A-6R8	ZT-5568			
C23	100			TCN-100	N750L-101	NT-531			
C24	1000			DD-102	801-001	DC-521			
C25	1000								
C26	1000								
C27	.05	200	22011240	DF-503		PT415	IMP2-S5	330215	
C28	.25	200				PT4025	IMP2-P25	3302025	Note 1
C29	.02	400	22012200	DF-203	817-02	PT412	IMP4-S2	330412	Note 2
C30	100	500	23004630	TCZ-100	NP0-337-101	MCB235		KR-1310	
C31	5		23001990	TCZ-4R7	NP0A-050	ZT-555		KR-1550	
C32	1500		23064640	DD-152	801-0015	DC-5215		C-1215	
C33	390		23002190	D6-391	GP2K-391	UC-5339		K-1339	
C34	1500		23064640	DD-152	801-0015	DC-5215		C-1215	
C35	1500		23064640	DD-152	801-0015	DC-5215		C-1215	
C36	470		23002200	D6-471	GP2K-471	UC-5347		K-1347	
C37	1500		23064640	DD-152	801-0015	DC-5215		C-1215	
C38	1500		23064640	DD-152	801-0015	DC-5215		C-1251	
C39	10000		23066020	DD-103	811-01	DC-511			Note 2
C40	10000		23066020	DD-103	811-01	DC-511			Note 2
C41	680		23002220	D6-681	GP2K-681	UC-5368		K-1368	
C42	1500		23064640	DD-152	801-0015	DC-5215		C-1215	
C43	1500		23064640	DD-152	801-0015	DC-5215		C-1215	
C44	1500		23064640	DD-152	801-0015	DC-5215		C-1215	
C45	1500		23064640	DD-152	801-0015	DC-5215		C-1215	
C46	1500		23064640	DD-152	801-0015	DC-5215		C-1215	
C47	15		23000520	D6-150	GP1K-150	UC-5415		K-1415	
C48	47		23000131	TCZ-47	NP0-338-470	ZT-5447		KR-1447	
C49	1000		23002740	D6-102	GP2L-102	UC-521		K-1210	
C50	.05	400	22011740	DF-503		PT415	IMP4-S5	330415	
C51	820		23002230	D6-821	GP2L-821			K-1382	
C52	.05	600	22017740	DF-503		PT615	IMP6-S5	330615	
C53	.002	600	22012180	D6-202	GP2-333-202	PT622	IMP6-D2	330622	
C54	.005	600		D6-502	GP2-333-502	PT625	IMP6-D5	330625	Note 1
C55	1.0	100	22010850			PT41	CT2-1	330210	
C56	1500		23064640	DD-152	801-0015	DC-5215		C-1215	
C57	2.2		23041160	TCZ-2R2	NP0A-2R2				
C58	.05	400	22011740	DF-503		PT415	IMP4-S5	330415	

PROPERTY OF
L. F. BLANKENSHIP
3924 MEADE ST.
DENVER, COLORADO

CAPACITORS (cont)

ITEM No.	RATING CAP.	RATING VOLT	REPLACEMENT DATA CBS-Columbia PART No.	CENTRALAB PART No.	ERIE PART No.	MALLORY PART No.	PYRAMID PART No.	SANGAMO PART No.	NOTES
C59	5000		23056480	DD-502	811-005	DC-525		C-1250	
C60	5000		23056480	DD-502	811-005	DC-525		C-1250	Note 2
C61	470		23002300	D6-101	GP2K-471	MC245		K-1247	
C62	1000		23002340	D6-102	GP2L-102	UC-521	IMP6-D1	K-1210	
C63	1000		23002340	D6-102	GP2L-102	UC-521	IMP6-D1	K-1210	Note 3
C64	220		23005180	D6-221	GP2K-221	UC-3323		K-1223	
C65	.05	600	23012340	DF-503		PT615	IMP6-S5	330615	
C66	.022	500	23012300	DF-320	617-03	PT2423	IMP4-S33	3304122	
C67	.001	600	23017940	D6-102	GP2L-102	PT621	IMP6-D1	330621	
C68	.002	600	23012100	D6-302	GP3-333-302	PT625	IMP6-D3	330623	
C69	.047	600	23012320	DF-503		PT2647	IMP6-S47	3306147	
C70	.001	600	23012040	D6-102	GP2L-102	PT621	IMP6-D1	330621	
C71	.1	300	23012380	DF-104		PT2681	IMP3-P1	330281	
C72	.02	400	23011700	DF-203	617-03	PT2412	IMP4-S3	330412	
C73	560	500	30004030	D6-561	GP2K-561	UC-5356		K-1356	
C74	270	500	30003940	D6-271	GP2K-271	UC-5327		K-1327	
C75	.01	600	23012160	D6-103	GP3-333-103	PT631	IMP6-S1	330611	
C76	.005	600	23012120	D6-502	GP3-333-502	PT635	IMP6-D5	330625	
C77	.0047	600	23012120	D6-472	GP3-333-472	PT2647	IMP6-D47	3306347	Note 4
C78	.005	600	23012120	D6-502	GP3-333-502	PT635	IMP6-D5	330625	
C79	4700	500	30011940			MC2468		CR-1247	
C80	.01	600							Note 5
C81	.03	600	23012300	DF-303	617-03	PT612	IMP6-S3	330612	
C82	.033	600	22000021			PT6123		3306123	
C83	.1	600	23012280	DF-104		PT601	IMP6-P1	330601	Note 2
C84	1800		23004640	DD-153	801-0015	DC-5215		C-1215	Note 2
C85	.02	600	23012340	DF-503		PT615	IMP6-S5	330615	
C86	.05	600	23012340	DF-503		PT615	IMP6-S5	330615	
C87	.05	600	23012340	DF-503		PT615	IMP6-S5	330615	
C88	.001	600	23017940	D6-102	GP2L-102	PT621	IMP6-D1	330621	
C89	.001	600	23017940	D6-102	GP2L-102	PT621	IMP6-D1	330621	
C90	.005	600	23017630	D6-502	GP3-333-502	PT625	IMP6-D5	330625	
C91	.005	1000	23018120	DD-502		PT1625	CT10-D5	3118-005	
C92	.005	500	23017630	D6-502	GP3-333-502	PT625	IMP6-D5	330625	
C93	.05	600	23017740	DF-503		PT615	IMP6-S5	330615	
C94	3900	500	23013130			MC3483		KR-1239	
C95	680	500	30004680	D6-681	811-581			KR-1368	
C96	390	500	30003980	D6-391	811-391	MC2343		KR-1339	
C97	470	500	30004060	D6-471	811-471	MC245		K-1247	
C98	22	500	23003660	D6-220	831-220	MC2230		KR-1422	Note 6
C99	.05	600	23017740	DF-503		PT615	IMP6-S5	330615	
C100	.05	600	23017740	DF-503		PT615	IMP6-S5	330615	
C101	.05	600	23017740	DF-503		PT615	IMP6-S5	330615	
C102	500	3000	23000101	TY3-502	413	HV24003A			
C103	130	3000		DD30-131					
C104	5000		23056480	DD-502	811-005	DC-525		C-1250	

Note 1. Some versions use .047MFD in this application (part #23012240).
Note 2. Not used in some versions.
Note 3. Some versions use 10000MMF in this application (part #23066040).
Note 4. Some versions use .01MFD in this application (part #23012160).
Note 5. Some versions use .005MFD in this application (part #23012120).
Note 6. Early production versions use a 25-280MMF variable trimmer in this application.

CONTROLS

ITEM No.	RATING RESISTANCE	RATING WATTS	REPLACEMENT DATA CBS-Columbia PART No.	IRC PART No.	CLAROSTAT PART No.	CENTRALAB PART No.	MALLORY PART No.	INSTALLATION NOTES
R1A	5000Ω	½	30601291	QJ-774	RTV-393	F1-21	UF53R	Picture (Panel)
B	250KΩ	½				R3-25	UR254A	Volume (Rear) Attach to R1A
C	Switch					K3-1	US-36	Attach to R1B
R1A	5000Ω	½	30600461	QJ-537	RTV-393	F1-21	UF53R	Picture (Panel)
B	250KΩ	½				R3-25	UR254A	Volume (Rear) Attach to R1A-See Note 1.
C	Switch					K3-1	US-36	Attach to R1B
R2A	100KΩ	½	3600035Ω	Q11-128	A47-100K-S	AB-40	U-41	Brightness
B	Shaft		Not Req.	Not Req.	KS8-3	AK-4	Not Req.	Attach to R2A
R3A	1Meg	½	3600053	Q11-137	A47-1Meg-S	AB-48	U-57	Vertical Hold
B	Shaft		Not Req.	Not Req.	KS8-3	AK-4	Not Req.	Attach to R3A
R4A	5000Ω	½	3600054	Q11-124	A47-5000-S	AB-10	U-14	Horizontal Hold
B	Shaft		Not Req.	Not Req.	KS8-3	AK-4	Not Req.	Attach to R4A
R5A	5Meg	½	3600043	Q11-141	A47-5Meg-S	AB-57	SU-57	Height
B	Shaft		Not Req.	Not Req.	FK3-1/4	AK-1	Not Req.	Attach to R5A
R6A	5000Ω	3	3600106	WK-5900	A43-5000	VK-138	R5000L	Vertical Linearity
B	Shaft		Not Req.	Not Req.	FK3-1/4	Not Req.	Not Req.	Attach to R6A
R7A	5000Ω	3	3600106	WK-5900	A43-5000	VK-138	R500L	Width
B	Shaft		Not Req.	Not Req.	FK3-1/4	Not Req.	Not Req.	Attach to R7A
R8A	5Meg	½	3600043	Q11-141	A47-5Meg-S	AB-57	SU-57	Local-Distant
B	Shaft		Not Req.	Not Req.	FK3-1/4	AK-1	Not Req.	Attach to R8A

*CONCENTRIKIT EQUIVALENT: K-4 KIT, BASE ELEMENTS & SHAFTS: B17-114, P1-116 (Panel) B13-130, R14-304 (Rear) Switch-76-1
▲CONCENTRIKIT EQUIVALENT: K-2 KIT, BASE ELEMENTS AND SHAFTS: B17-114, P1-116 (Panel) B13-130, R8-305 (Rear) 76-1, Switch
*UNIVERSAL REPLACEMENT (MALLORY EXACT DUPLICATE PART NO. UE5702).
†UNIVERSAL REPLACEMENT (MALLORY EXACT DUPLICATE PART NO. UE5703).
NOTE 1. THIS CONTROL USED IN SOME VERSIONS OF CHASSIS 921-94.

RESISTORS

ITEM No.	RATING OHMS	RATING WATT	REPLACEMENT DATA CBS-Columbia PART No.	IRC PART No.	NOTES
R9	15KΩ	½			
R10	47KΩ	½		BTS-47K	
R11	330KΩ	½			
R12	220KΩ	½			
R13	470Ω	½		BTS-470	
R14	220KΩ	½			
R15	15KΩ	½			
R16	15KΩ	½		BTS-15K	
R17	10KΩ	½			
R18	470Ω 5%	½		BTS-470 5%	
R19	3900Ω	½	30302330	BTS-3900	
R20	10KΩ	½	30302230		
R21	330Ω	½	30302250	BTS-330	
R22	47Ω	½	30470230	BTS-47	
R23	1000Ω	1	30302340	BTA-1000	
R24	18KΩ	½	30302330		
R25	47Ω	½	30470230	BTS-47	
R26	1200Ω	½		BTS-1200	Note 1

PARTS LIST AND DESCRIPTIONS (Continued)

RESISTORS (cont)

ITEM No	RATING OHMS	RATING WATT	REPLACEMENT DATA CBS-Columbia PART No	IRC PART No	NOTES
R27	1000Ω	½	30302340	BTA-1000	
R28	470KΩ	½	30474230		
R29	470KΩ	½	30474230		
R30	18KΩ	½	30302330		
R31	150Ω	½	30302250	BTS-150	
R32	470Ω	½	30471230	BTS-470	
R33	4700Ω	½	30472330		
R34	22KΩ	1	30302330	BTS-22K	
R35	39KΩ	½	30393330		
R36	220Ω	½	30222230	BTS-220	
R37	4700Ω	½	30472230		
R38	3300Ω	1	30332240		
R39	1Meg	½	30106230		
R40	100Ω	½	30102230	BTS-100	
R41	27KΩ	½	30272230		
R42	110Ω 5%	2	30131150		
R43	18KΩ	2	30183250		
R44	270KΩ	½	30274230		
R45	150KΩ	½	30154230		
R46	1Meg	½	30106230		
R47	33KΩ	½	30333230		
R48	270KΩ	½	30274230		
R49	150KΩ	½			Note 2
R50	150KΩ	½			Note 2
R51	56KΩ	½	30563230		
R52	100KΩ	½	30104230	BTS-100K	
R53	68Ω	½	30680230	BTS-68	
R54	270KΩ	½		BTS-470	Note 3
R55	47Ω	½		BTS-47	Note 4
R56	39KΩ	½	30393230	BTS-39K	
R57	56KΩ	½		BTS-56K	Note 5
R58	27KΩ	½	30273230	BTS-27K	
R59	560KΩ	½	30564230	BTS-560K	
R60	33KΩ	½	30333230	BTS-10Meg	
R61	82Ω	½	30821230	BTS-820	
R62	5600Ω	½	30562230	BTS-5600	
R63	470KΩ	½	30474230	BTS-470K	
R64	470KΩ	½	30474230	BTS-470K	
R65	1MEG	½	30331240	BTA-330	
R66	1500Ω	4	31000101	PW4-1500	
R67	12KΩ	½	30123230		
R68	2.2Meg	½	30225230		
R69	330KΩ	½	30334230		
R70	2.2Meg	½	30225230		
R71	33KΩ	1			Note 8
R72	15KΩ	½	30153230		
R73	27KΩ	½	30223230		
R74	1Meg	½	30105230		
R75	1Meg	½	30105230		
R76	2700Ω	½	30272330		
R77	6800Ω	½	30682230		

ITEM No	RATING OHMS	RATING WATT	REPLACEMENT DATA CBS-Columbia PART No	IRC PART No	NOTES
R78	3900Ω	½	30392230		
R79	33KΩ	½	30333230		
R80	8200Ω	½			Note 7
R81	8200Ω	½	30822230		
R83	1.5Meg	1 5%	30251140		
R83	15KΩ	½	30153230		
R84	470KΩ	½	30474230		
R85	27KΩ	½	30273230		
R86	47KΩ	½	30473230		
R87	2.2Meg	½	30225230		
R88	680Ω	½	30681240		
R89	1000Ω	½	30102230		
R90	2200Ω	½	30222230		
R91	33KΩ	½	30333230		
R92	560Ω	½			
R93	560Ω	½			
R94	100KΩ	½	30104230		
R95	100KΩ	½	30104230		
R96	27KΩ	½	30273240		
R97	27KΩ	½	30273230		
R98	470KΩ	½	30474230		
R99	3.3Meg	½	30335230		
R100	18000Ω 5%	½	30182230		
R101	6800Ω	½	30682220		
R102	100KΩ	½	30104230		
R103	270KΩ	½	30274230		
R104	100KΩ	½	30104230		
R105	1000Ω	½	30102240		
R106	15KΩ	½	30153230		
R107	470KΩ	½	30474230		
R108	82Ω	½	30820230		
R109	68Ω	2	30681250		
R110	680Ω	2	30681250		
R111	3300Ω	2	30332250		
R112	1000Ω	½			Note 8
R113	10KΩ	1	30103240		
R114	1000Ω	1			
R115	1Meg	½	30105230		
R116	3.9Meg	½	30395230		
R117	470Ω	½	31000900		
R118	1Meg	½	30105350		
R119	1.2Ω	1	30000061		
R120	1.2Ω	1	30000061		Note 4
R121	1.2Ω	1	30000061		Note 4
R122	90000Ω	5	31000095		
R123	1000Ω	1	30102340	BTA-1000	Note 4
R124	1.8Meg	½	30185230		
R125	10Ω	½	31000096		
R126	220KΩ	1	30224340	BTS-220K	

Note 1. Some versions use a 1800Ω resistor in this application.
Note 2. Some versions use a 100KΩ resistor in this application.
Note 3. Some versions use a 12000 resistor in this application.
Note 4. Not used in some versions.
Note 5. Some versions use a 560KΩ resistor in this application.
Note 6. Some versions use a 27KΩ resistor in this application.
Note 7. Some versions use a 22KΩ resistor in this application.
Note 8. Some versions use a 4700Ω resistor in this application.

TRANSFORMER (POWER)

ITEM No	RATING PRI	RATING SEC. 1	RATING SEC. 2	REPLACEMENT DATA CBS-Columbia PART No.	Halldorson PART No.	Merit TYPE No.	RCA TYPE No.	Stancor PART No.	Thordarson PART No.	Triad PART No.
T1	117V 60 CY ④ 1.72A	586VCT ⑤ 240A	5VAC ③ 3A	10000561-A	PW739①	P-3055		P-8187①	32R34③	R-8LSC③
	SEC. 3	SEC. 4	SEC. 5							
	6.3VAC ② 1.2A	6.3VAC ② 6.7A								

① File mounting slots if necessary.
② Tape @ 3V ③ 1.2A winding.
③ Parallel and phase 6.3V ② 6A windings for Sec. #4.

TRANSFORMERS (SWEEP CIRCUITS)

ITEM No.	USE	REPLACEMENT DATA CBS-Columbia PART No	Halldorson PART No	Merit PART No.	RCA TYPE No	Ram PART No.	Stancor PART No	Thordarson PART No	Triad PART No
T2	Vert. Osc. Trans.	10000063	B6702	A-3003	209T1①	V405	A-8125	26A03	A-97X
T3	Vert. Output Trans.	12000641	F3419 *		225T1 *			FLY-18 *	D-50 *
T4	Vert. Output Trans.	10000551	21802②	A-3038②		V302①	A-8143②	26G72 ④	A-108X④
T5A	Yoke(90°) Foc.(.03MF)	10000201 ③	DF908 ④	MDF-91	219D1⑤		DY-13A ⑤	Y-14 ⑤	Y-40-1④
B	Vert.(.33MF) Horiz. Lin. Coil								
T6	Horiz. Lin. Coil (1.2-106Ω)	16000351	RF800②⑦	MWC-6④	215R1	201R15	WC-8	WC-23	WC-12④

① Drill new mounting hole(s).
② Connect as auto transformer.
③ Includes capacitor C103, resistors R92, R93 and R114.
④ Connect horizontal yoke damping network across terminals #3 and #7. Use original network if necessary.
⑤ Use original yoke damping network.
⑥ Enlarge mounting hole.
⑦ Connect to terminals #3 and #4.
⑧ Connect to coded red and blue terminals.

*HORIZONTAL OUTPUT TRANSFORMER CONNECTION DATA

Use Original Width Coil Unless Replacement Type Is Listed

ORIGINAL TERMINAL CONNECTIONS	Halldorson Replacement Connections	Merit Replacement Connections	RCA Replacement Connections	Ram Replacement Connections	Stancor Replacement Connections	Thordarson Repairment Connections	Triad Replacement Connections
9	9	9	9		9	9	9
7	7	7	7		7	7	7
5	5	5	5		5	5	5
4	4	4	4		7	4	4
3	3	3	3		3	3	3
1	1	1	1		1	1	1

TRANSFORMER (AUDIO OUTPUT)

ITEM No.	IMPEDANCE PRI.	IMPEDANCE SEC.	REPLACEMENT DATA CBS-Columbia PART No.	Halldorson PART No.	Merit PART No.	Stancor PART No.	Thordarson PART No.	Triad PART No.	NOTES
T7	4.8KΩ	L 75Ω	Part of 8PKR. 73000481	Z1107①	A-3830①	A-3879①	34S51 ①	S-2X ①	① Bend mounting tabs down, file out slots, mount on original mounting bracket.

SPEAKER

ITEM No.	RATINGS SIZE	RATINGS FIELD	RATINGS V. C. IMP.	REPLACEMENT DATA CBS-Columbia PART No.	QUAM PART No.	NOTES
SPK	6"	PM	3.5Ω	73000171	6AI	
SPK	6"	PM	3.5Ω	73000481	6AI	

COILS (RF-IF)

ITEM No.	USE	DC RES PRI	DC RES SEC.	REPLACEMENT DATA CBS-Columbia PART No.	MEISSNER PART No.	MERIT PART No.	MILLER PART No.	NOTES
L1	IF trap	0Ω						Wound on 68MMF cap.
L2	IF trap	0Ω						Wound on 68MMF cap.
L3	Antenna coils	0ΩCT	0Ω					
L4	Trap coil	.3Ω						
L5	Fil. choke	0Ω						
L6	Neut. coil	0Ω						
L7	RF, mixer grid, osc. coils	0Ω						
L8	Fil. choke	0Ω						
L9	R3 coil	0Ω						
L10	Feedback coil	1.6Ω						
L11	Osc. plate	3Ω						
L12	1st video IF	.1Ω		12000941	17-5000*	TV-125*	6231*	
L13	2nd video IF	.8Ω		12000971	17-5003	TV-127	6232	Includes 4L 25MC trap
L14	Fil. choke	0Ω		18000181	19-1001		4604	L 6 Microhenries
L15	3rd video IF	.1Ω		12000781	17-4521●	TV-128	6233	Includes 47, 35MC trap
L16	Fil. choke	0Ω		18000181	19-1001		4604	L 6 Microhenries
L17	4th video IF	.3Ω	.2Ω	12000801	17-4531●			Includes 3U, 75MC trap
L18	Shunt peaking coil	12.5Ω		18000056	19-3250	TV-185	6184	269 Microhenries
L19	Series peaking coil	9.5Ω		18000058	19-3300	TV-190	6155	340 Microhenries
L20	Series peaking coil	7.5Ω		18000041	19-3125		6153	118 Microhenries
L21	Shunt peaking coil	7.5Ω		18000041	19-3125		6153	118 Microhenries
L22	Series peaking coil	8.5Ω		18000042	19-3150	TV-184	6180	172 Microhenries
L23	Shunt peaking coil	9Ω		18000044	19-4400	TV-190	4648	380 Microhenries
L24	Sound IF	6.5Ω		18000481	17-3495*	TV-13*	1470A	
L25	Ratio Det.	5.8Ω	2.4ΩCT	12000720	17-3497	TV-115	6205	Tertiary windings, TG
L26	Horiz. Osc.	62Ω		18000111	19-1576	TV-183	6210	

*Use ① winding only.
●Drill mounting holes.

FILTER CHOKE

ITEM No	RATINGS TOTAL DIRECT CURRENT	RATINGS D C RESISTANCE	RATINGS INDUCTANCE 10 CURRENT 1000 ~	REPLACEMENT DATA CBS-Columbia PART No.	Halldorson PART No.	Merit PART No.	Stancor PART No	Thordarson PART No	Triad PART No
L27	.240 ADC	68-80	2. 7 SHY	14000101			C-2334 ①	20C44	

① Drill one new mounting hole.

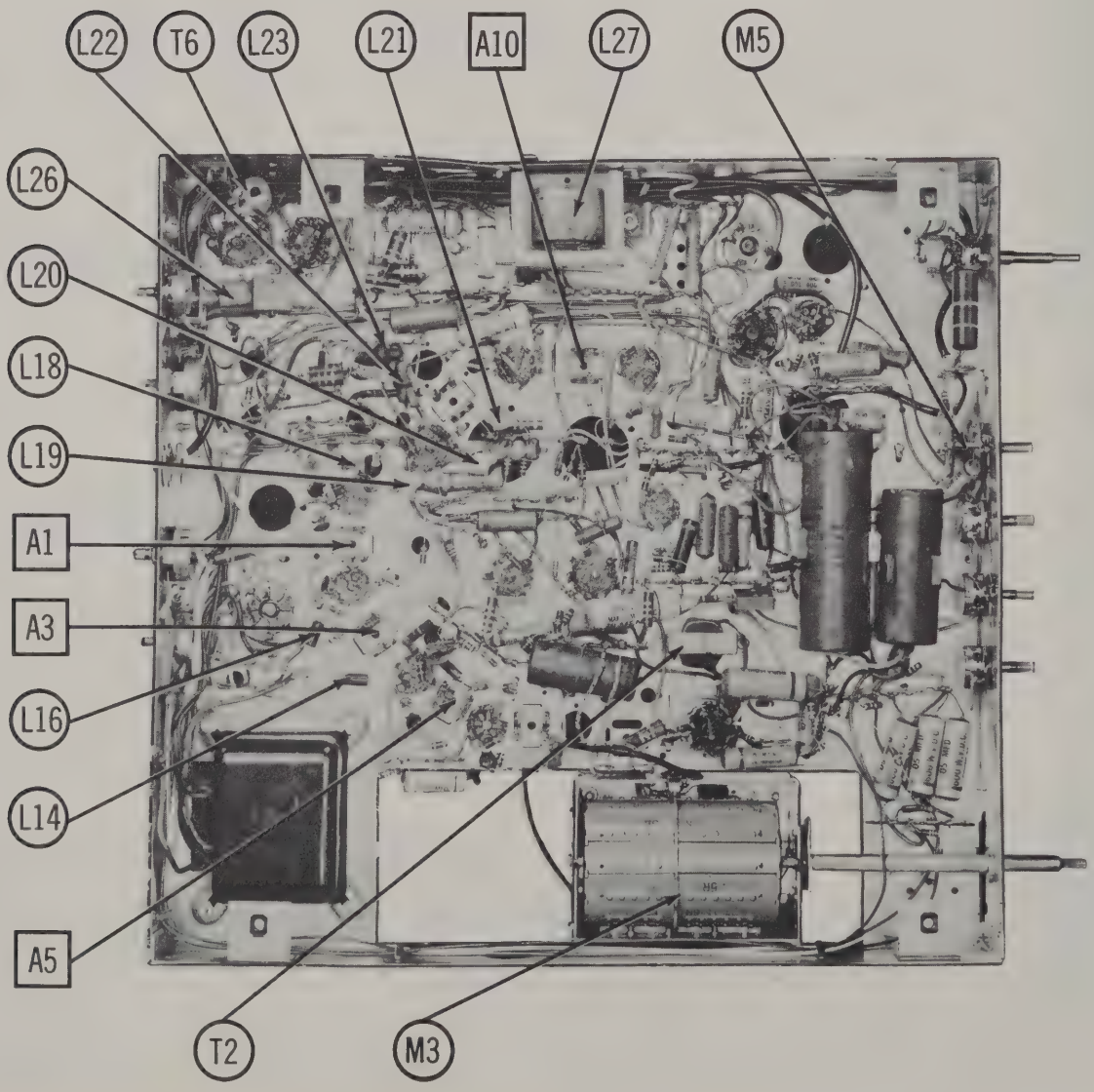
PARTS LIST AND DESCRIPTIONS (Continued)

FUSES

ITEM No.	TYPE	RATING	REPLACEMENT DATA					
			CBS-Columbia PART No.		LITTELFUSE PART No.		BUSS PART No.	
			FUSE	HOLDER	FUSE	HOLDER	FUSE	HOLDER
M1	3AG S/B P/T	6/10A 125V	43000050		315.600 (3AG S/B P/T 6/10A)		MDV 6/10	

MISCELLANEOUS

ITEM No.	PART NAME	CBS-Columbia PART No.	NOTES
M2	Dial Light	6400001l	#47-Not used in all versions.
M3	Tuner	PC541497	VHF
M4	Trap		VHF antenna input filter-Not used in all versions.
M5	Switch	40000261	Phono, music, voice (3 position-rotary).
M6	Focus magnet	19000201	Includes centering device.
M7	Ion trap	19000211	
	Knob	76002503	Channel selector
	Knob	76002521	Fine tuning
	Knob	76002511	On-off-volume
	Knob	76002531	Contrast
	Knob	76002811	Brightness, vert, & horiz. hold.
	Knob	76002561	Phono, music, voice switch
	Safety glass	77000355	
	Mask	71001301	



CHASSIS BOTTOM VIEW-TRANS., INDUCTOR & ALIGN. IDENTIFICATION

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TROUBLE SHOOTING AIDS (cont)

HIGH VOLTAGE

LOSS OF HIGH VOLTAGE

Check by substitution V16, V17, V18 and V19. Check waveform W18.

If Satisfactory	If Unsatisfactory
Check T3, T5A, T6, C99, C100, C101, R111 and other associated components.	Check L26, C94, C95, C97, R101, R100, R104, R102 and other associated components.

INSUFFICIENT HIGH VOLTAGE

Check by substitution V17, V18 and V20. Check C97, R104, R111, T3 and other associated components.

BLOOMING

Check by substitution V17, V18, V19 and V20. Check T3, T5A, R111, R118, C97 and other associated components.

GENERAL

RASTER, SOUND, NO PICTURE

Follow procedure outlined under "Loss of Video".

RASTER, PICTURE, NO SOUND

Follow procedure outlined under "Weak or no Sound".

RASTER, NO SOUND, NO PICTURE

Check by substitution V1, V2, V3, V4, V5, V6 and V7. Check video IF components for failure or change of value.

NO RASTER, NO SOUND

Follow procedure outlined under "Dead Set". Check M5 switch.

KEYSTONE EFFECT

Check T5 and its associated components.

INTERMITTENT STREAKS

Check high voltage section for corona discharge and arcing.

Symptoms shown are assumed and are not indicative of the quality and workmanship of this equipment.

SERVICING IN THE FIELD

TUNER OSCILLATOR ADJUSTMENTS

Touch-up adjustments of the VHF tuner oscillator circuit may be accomplished by removal of the channel selector and fine tuning knobs. The adjustments are accessible, one at time, thru the small hole in the cabinet to the right of the channel selector shaft.

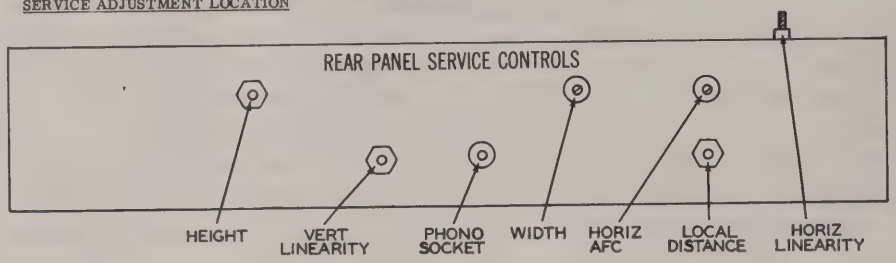
PICTURE TUBE SAFETY GLASS CLEANING

To clean safety glass remove 5 wood screws holding metal strip at the top of the safety glass. Remove metal strip and safety glass. Use extreme caution when removing safety glass.

PICTURE TUBE REMOVAL

For picture tube removal it is necessary to remove chassis. (See disassembly instructions).

SERVICE ADJUSTMENT LOCATION



HORIZONTAL OSCILLATOR FIELD ADJUSTMENT

Adjustment of the horizontal oscillator circuit can be made from the rear panel of the chassis. Set the horizontal hold control at its mid-range position and adjust the horizontal AFC coil slug (L25) until the picture synchronize horizontally.

SOUND IF DETECTOR BUZZ ADJUSTMENT

To eliminate sound IF detector buzz, adjust the ratio detector secondary (L24) located on top of chassis. (See tube placement chart).

FUSES

One fuse is used for LV power supply protection. (For location see tube placement chart).

CENTERING

Centering is accomplished mechanically by means of a centering lever on the PM focusing assembly. Adjust the centering lever from side to side, and up and down until the picture is properly centered.

DISASSEMBLY INSTRUCTIONS

CHASSIS REMOVAL

1. Remove 4 push-on type control knobs, remove trim plate and remove 4 push-on type control knobs from front panel of cabinet.
2. Remove 9 wood screws and 1 metal screw. Remove rear cover.
3. Disconnect speaker plug and ground lead to test socket.
4. Remove 2 wood screws. Remove antenna bracket.
5. Remove 4 chassis bolts. Remove chassis.
6. Remove 4 speaker nuts. Remove 2 speakers.

NOTE: If it is necessary to remove the chassis for servicing, it is also, necessary to remove the speaker. The audio output transformer is mounted on the speaker (SP1) and must be connected to the receiver for proper operation.

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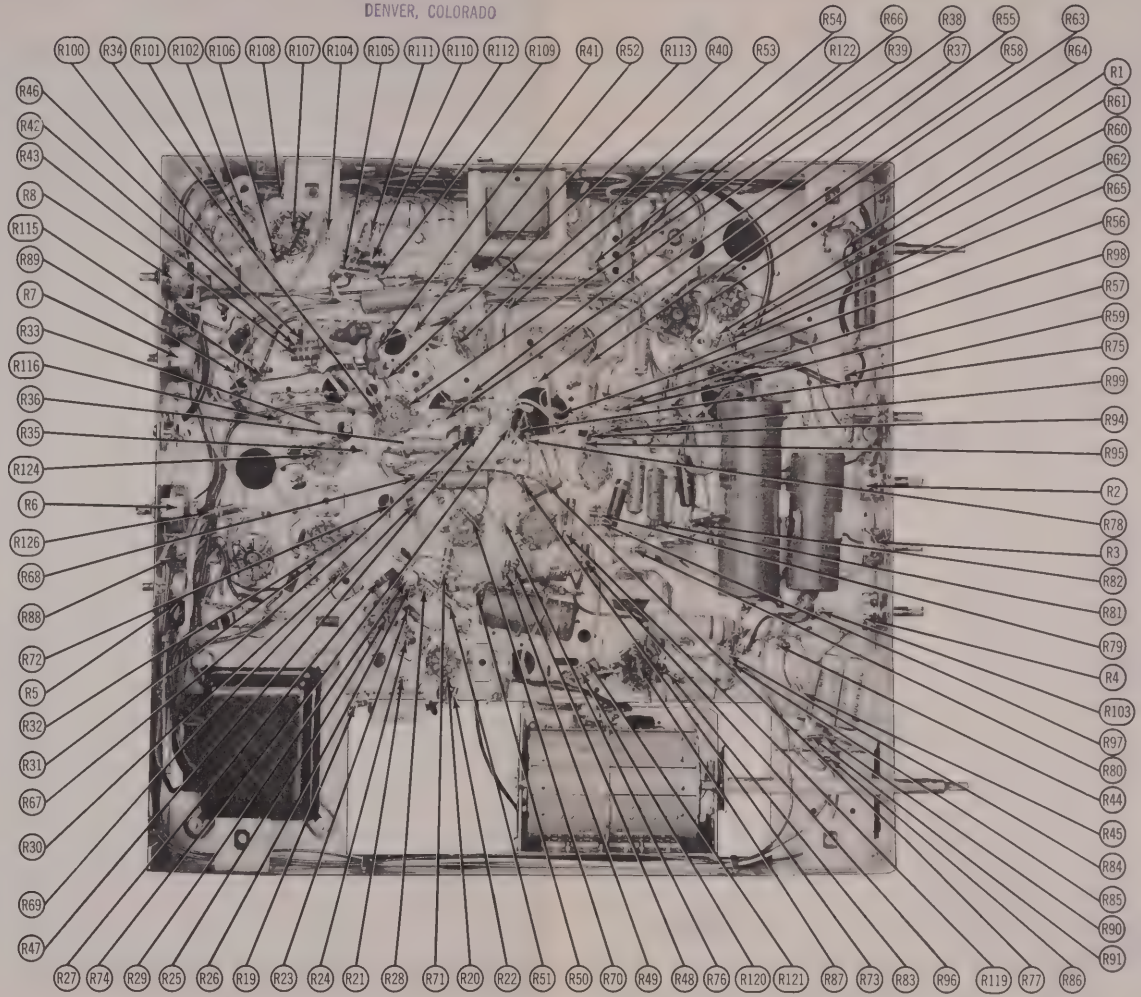

CHASSIS BOTTOM VIEW-RESISTOR IDENTIFICATION

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COLUMBIA-BELL & HOWELL
MODEL 355

Figure 1

COLUMBIA-BELL & HOWELL
MODEL 355

GENERAL INFORMATION

The Model 355 Columbia Bell & Howell Tape Recorder features Stop, Forward, Rewind, Play, and Record modes of operation merely by pressing a button. A speaker push button is also provided for monitoring programs or for using the recorder as a P.A. System. This recorder is of the dual-track type, giving two full length recordings on a single reel of recording tape. Any size reel up to 7" can be used. Two neon recording indicators simplify the recording level setting. New recordings can be made on previously recorded tape since the erase head is automatically connected when the "Record" button is pressed or the same recording may be played back indefinitely. Recordings can be made from a radio, television receiver, or phonograph, in addition to those made directly from the microphone. Recordings can be played back through the self-contained speakers or an external speaker may be connected through use of the Speaker Jack.

Model 355 is designed to operate on 115 volts, 60~, AC supply only.

CAUTION: Severe Damage Will Result If Connection Is Made To A Direct Current (DC) Line.

Columbia Records Inc.
799 Seventh Avenue
New York 19, New York

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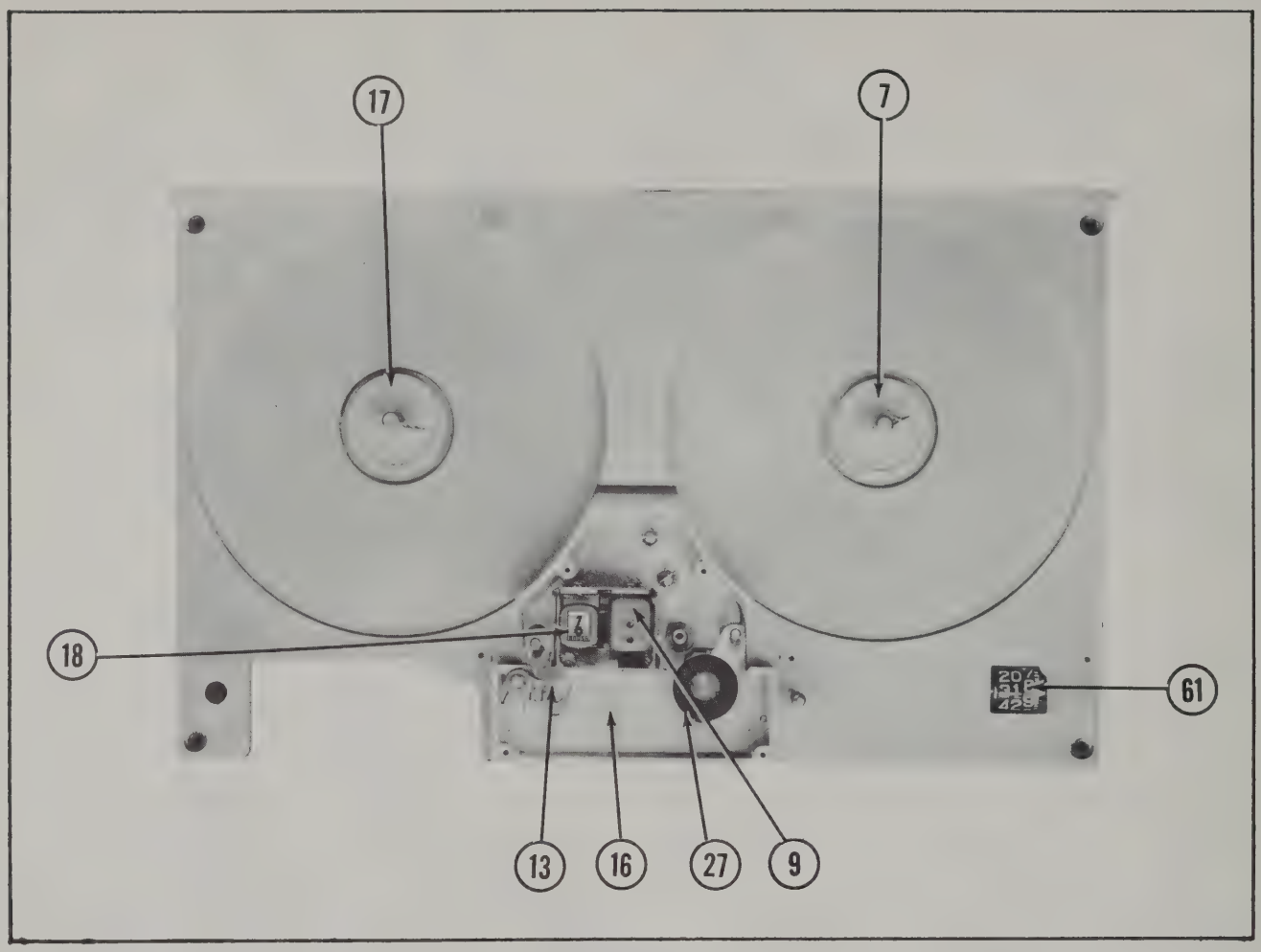

Figure 2

SPECIFICATIONS

Reel Size-

Up to 7".

Tracks-

Dual.

Track Selection-

Manual turnover.

Tape Loading-

Drop-in-slot type.

Tape Speed-Play and Record-

7 1/2 and 3 3/4 ips.

Fast Forward-

7" reel in 90 seconds.

Fast Rewind-

7" reel in 90 seconds.

Speakers-

2 electrostatic "tweeters".
2-8" low-frequency "Woofers".

Recording Time(7" reel)-

1 hour at 7 1/2 ips. (1/2 hour each track)
2 hours at 3 3/4 ips. (1 hour each track)

Overall Frequency Response-

(Record To Playback At 7 1/2 ips.)
±2db from 50 to 10,000 cps.

Distortion-

Less than 3% at 4 watts.

Power Output-

8 watts.

Wow and Flutter-

(At 7 1/2 ips.)
Less than 0.02%.

Audio Inputs-

Microphone, Radio, Phono, TV.

Audio Output-

(a)Internal or Extension Speaker.
(b)External Amplifier.

Controls-

3 knobs, 6 electric pushbuttons.

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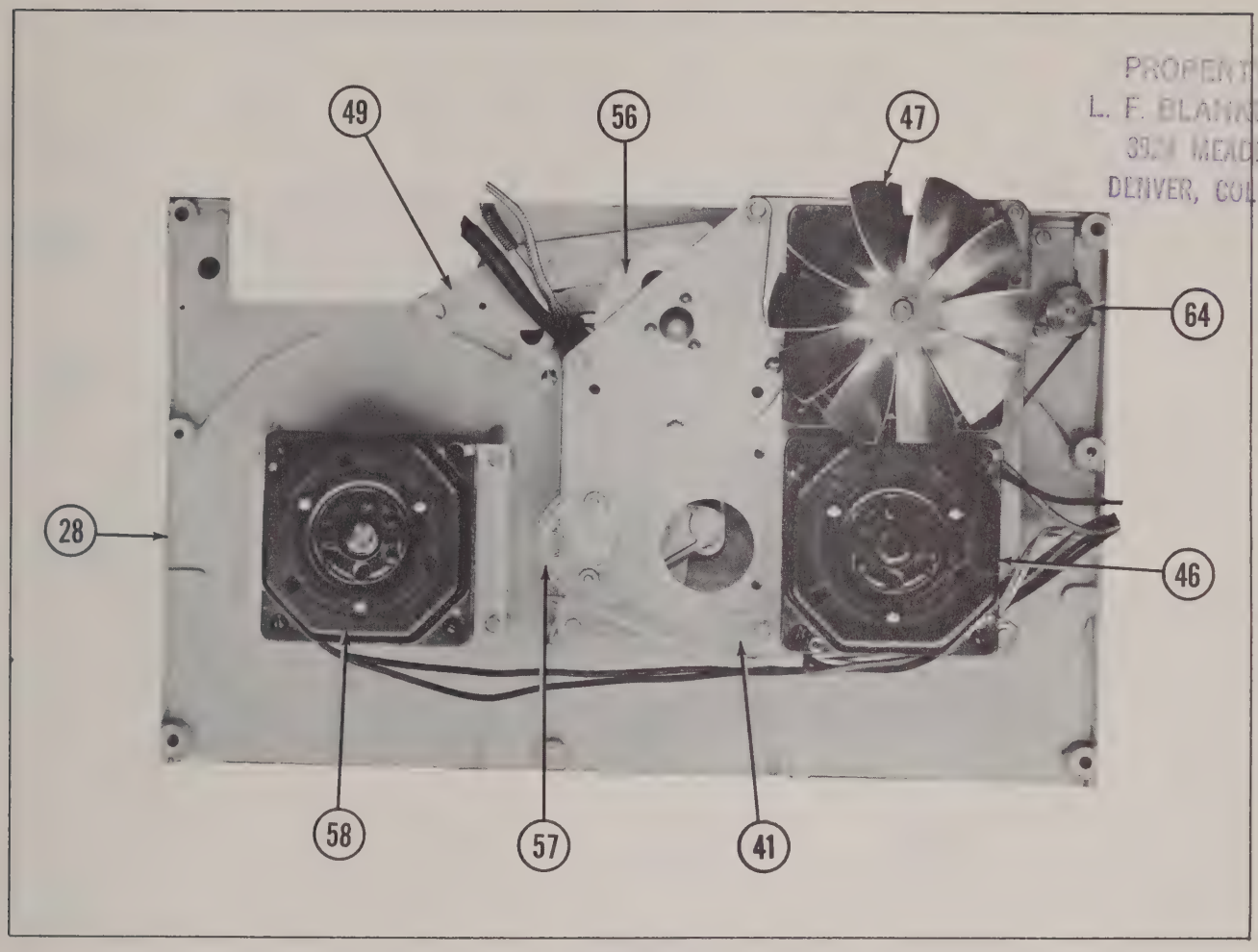

Figure 3

OPERATING INSTRUCTIONS

Making Connections-

Turn the "tone" control to the left to "Off" and plug the power cord into a convenient wall outlet of the proper rating.

Threading The Tape-

With the "Stop" button depressed, place an empty reel on the right hand (take-up) spindle. Place a full reel of tape on the left hand (supply) spindle so that the reel will turn counterclockwise when tape is pulled from the reel. Make certain that the reel springs on the spindles engage one of the slots in the hubs of the reels and that the reels are fully seated. Reel out about two feet of tape and feed the loose end up into the empty reel on the right spindle. Thread the tape into one of the slots in the outer surface of the hub. Hold the loose end between the fingers and slowly rotate this reel counterclockwise through a couple of revolutions. While taking up slack in the tape between the two reels the tape will automatically drop into the tape slot.

To Record From Microphone-

1. Insert the microphone plug into the "Mic. - Radio-Phono" input jack.

2. Turn the "Off-Tone-On" control to the right until a click is heard and allow approximately 30 seconds for the unit to warm up. "Power on" condition is indicated by indirect illumination of the lucite knobs from behind the front panel.

3. Unlock and push the "Record" button. Observe the "Record Level" indicator lamps while speaking into the microphone. Occasional flickering of the "Distortion" lamp indicates a good, high level of recording, however, continuous glowing or flashing in this lamp indicates that the "Volume" control setting must be reduced. Be sure that the "Normal" lamp glows fairly full and steady or you may not be recording properly, if at all.

NOTE: The "Tone" control is inoperative when recording.

Mic.-Radio-Phono Input-

This two-circuit, front-panel input jack provides a 220,000 ohm high-impedance input for the microphone and a low-impedance input for recording from a radio, phonograph or TV set. A two-conductor attachment cord is supplied in the storage compartment. This cord is terminated at one end with a jack plug and at the other with two alligator clips to enable you to make connection to various equipment for recording or monitoring.

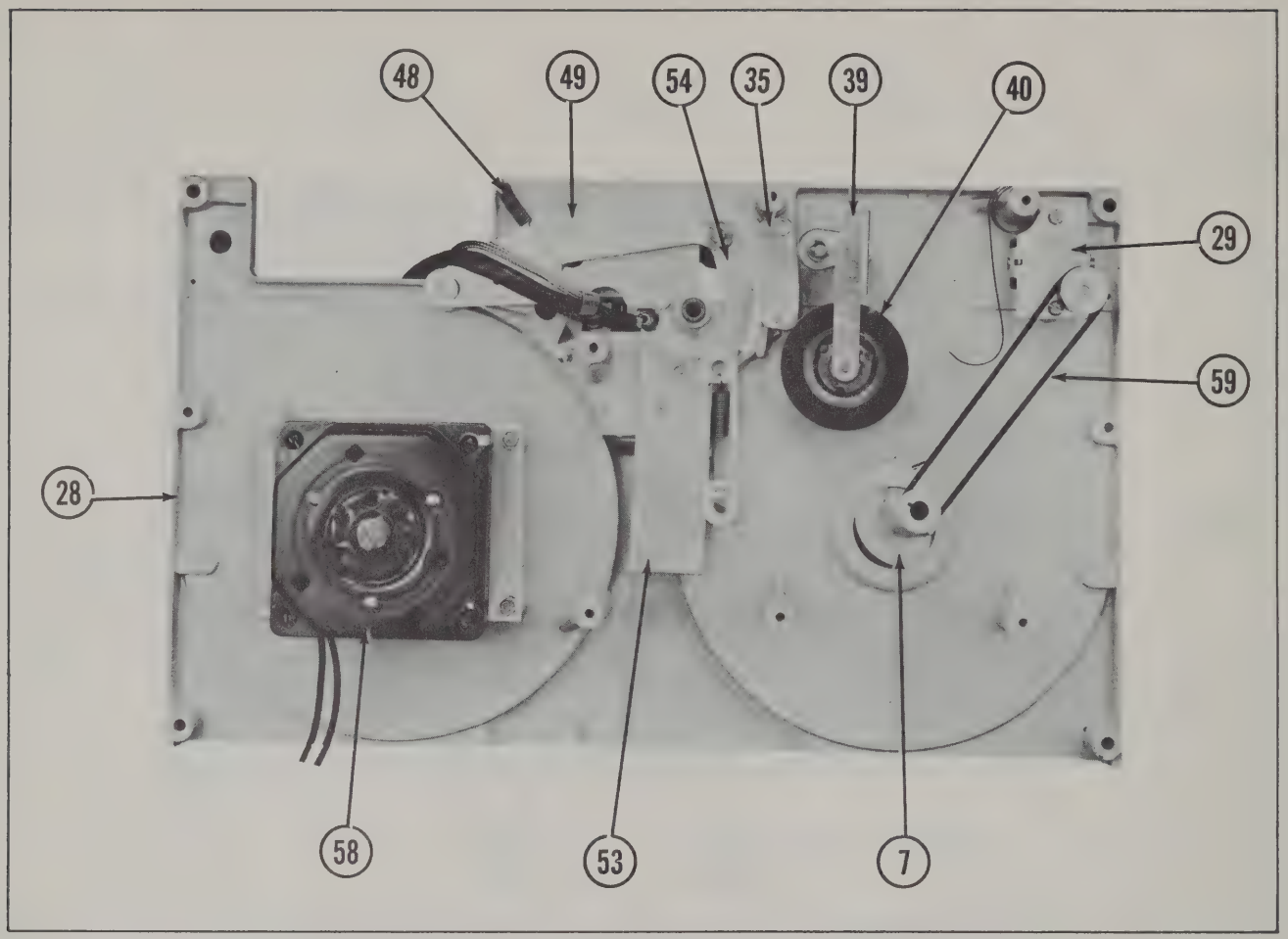

Figure 4

To Record From Radio, TV, Or Phonograph-

1. Take the radio-phono attachment cord from the storage compartment.

2. Turn off power to the recorder.

3. With the two alligator clips on the end of the radio-phono attachment cord, connect across the amplifier output or voice coil on the speaker of the radio, phono, or TV set.

4. Insert the plug of the radio-phono cord into the Mic.-Radio-Phono input jack on the front panel of the recorder .

5. Proceed with the recording as described in "To Record From Microphone".

Double-Track Recording-

The Columbia-Bell & Howell is designed so that only 1/2 the tape width is recorded at a time, thereby resulting in double-track recording. This double-track operation is accomplished in the following manner:

1. After a reel of tape has been recorded, i.e. all the tape wound on to the take-up reel, depress the "Stop" button. This stops all movement of the tape.

2. Remove the reels from the recorder, turning the full reel over and placing it on the left spindle and the empty reel on the right spindle.

3. Properly thread the tape and proceed with the recording.

4. After the second track has been recorded the first track is ready to be played, without rewinding, as follows:

(a) Place the full reel of tape on the left spindle and the empty reel on the right spindle.

(b) Thread the tape making sure the dull side faces the play-record head.

(c) Set the controls as described under "To Play A Recording".

To Play A Recording-

1. Thread the tape as described under "Threading The Tape".

2. Turn the "Off-Tone-On" control to the right and allow about 30 seconds for warm up.

3. Depress the "Play" button until it is latched into position.

4. Adjust the "Volume" and "Tone" controls for desired level.

To Edit And Splice Tape-

NOTE: Since it is impossible to edit and splice one track without affecting the other, recordings

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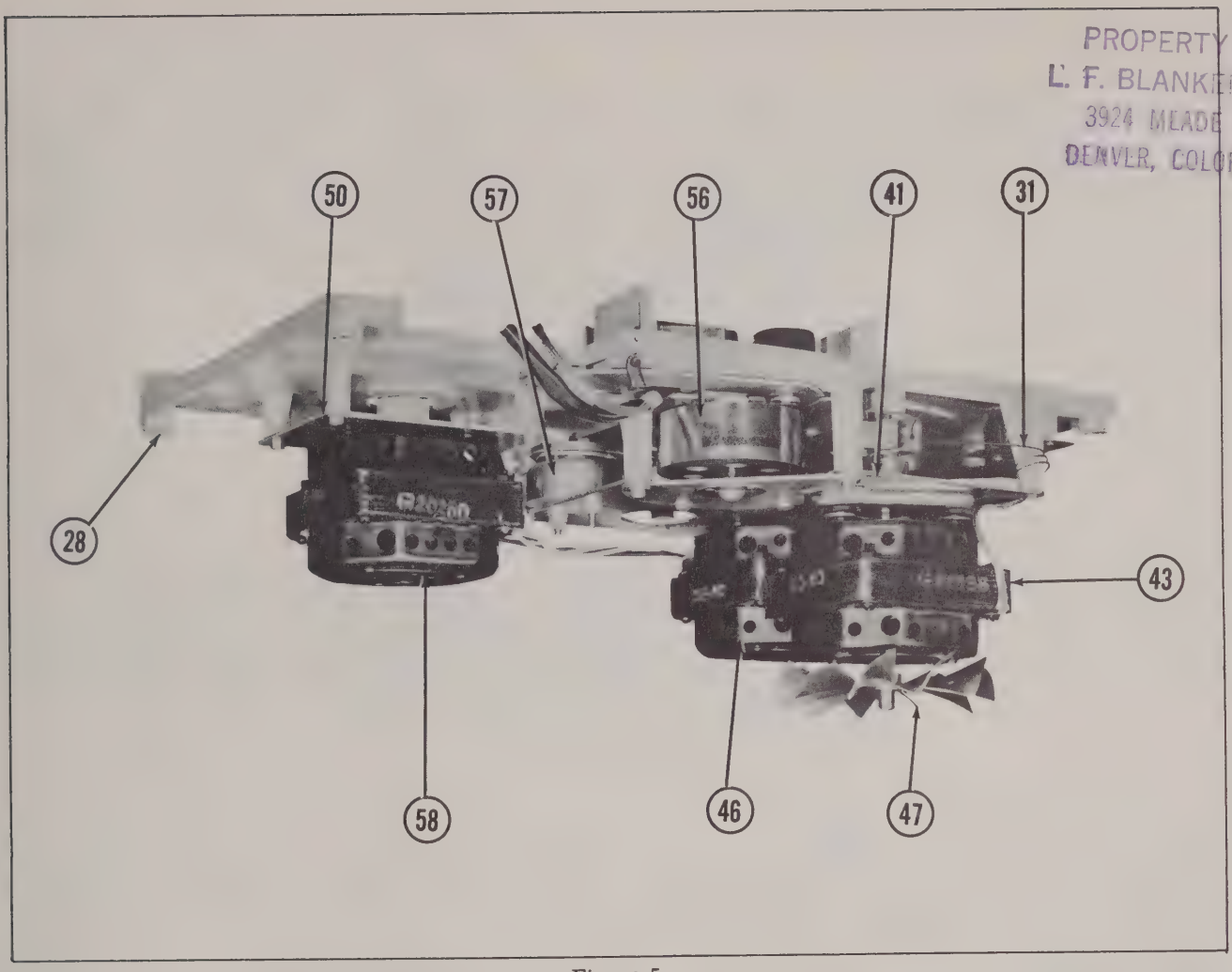

Figure 5

which are to be edited should be limited to one track only.

1. The tape may be edited by cutting out unwanted portions, or by joining selections into another sequence. Announcements may be inserted between selections, etc. Unused sections of tape can be spliced together for re-use.

(a) Cut tape at 60° angle with an overlap so ends will line up. (Cutting tape at 60° angle will eliminate detection of splice on recording.)

(b) Align both ends of tape, with glossy side up.

(c) Cover aligned ends with splicing tape, evenly and securely.

(d) Trim off excess splicing tape. (Cut into the recording tape very slightly.) This eliminates possibility of a sticky splice.

To Use External Speaker-

Any size speaker of the permanent magnet type, having a 3.2 ohm voice coil, may be used by connecting the alligator clips of the radio-phono cord across the voice coil of the external speaker and then inserting the radio-phono cord plug (same type as speaker plug) into the "Speaker" jack.

Fast Forward And Fast Rewind-

High-speed forward or rewind can be obtained by pressing the desired button. These functions are used primarily in locating a desired portion of a recording in a few seconds. You may press the "Forward" or "Rewind" button while in "Play" or "Record" positions but you cannot switch to other functions until you have first pressed the "Stop" button.

IMPORTANT: When pressing the "Stop" button... hold it down until the reels come to a complete stop.

To Use Recorder As A Public Address System-

To operate this recorder as a public address unit, insert the microphone plug into the "Mic.-Radio-Phono" input and turn the power on. At the back of the amplifier move the "Tape Drive" switch to "Off". Unlock and press the "Record" and "Speaker" buttons. While speaking into the microphone adjust the "Volume" and "Tone" controls to the desired level.

The public address program may be recorded by leaving the "Tape Drive" switch in the "On" position. Then, proceed with the program as described above.

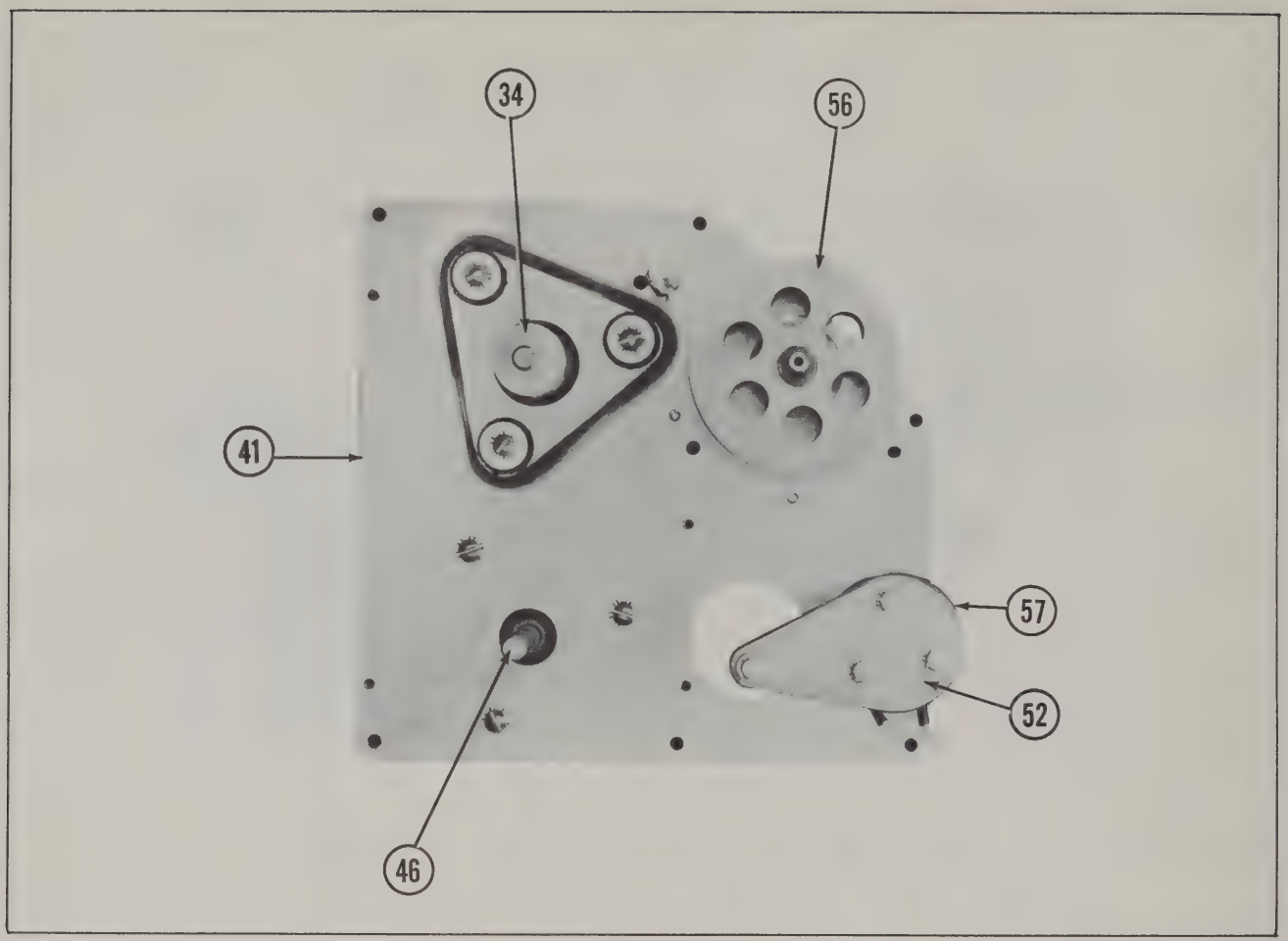

Figure 6

Program Indicator-

This odometer- type indicator registers "000" to "999" and will save much guesswork when trying to locate a desired portion of a pre-recorded tape. The reading of the indicator may be noted as the recording is being made so that reference to any given point on the tape may be made very rapidly. When a recorded tape has been so logged or referenced, always "zero" the indicator before starting to play the recording. This should be done before tape is threaded on the take-up reel. Press the "Forward" button and observe the indicator. Use the "Stop" button when approaching "000" and then the last few digits can be turned off manually by spinning the take-up reel with the fingers.

Speed Change-

This recorder operates at two speeds - 7 1/2 or 3 3/4 inches-per-second. The "Speed Change" knob will enable you to play or record tape at either speed. For 3 3/4" operation, take hold of the knob and turn it gently to the left, pull out, and release. To restore the setting to 7 1/2", take hold of the knob as before, turn it gently to the left, push in, and release.

ADJUSTMENTS

Play/Record Head Adjustment-

It is very important that play-record head (9) be lined up perfectly with the tape. If it is not, low output, loss of high frequencies or track overlap may result.

IMPORTANT: The heads have been aligned and locked in place at time of manufacture and should require no further adjustment, unless it becomes necessary to install a new head.

To adjust, make a tape recording of a 3000 cycle signal on a good unit. Place this on the unit that the head is to be aligned on. Connect an output meter or AC voltmeter across the speaker voice coil. Play the 3000 cycle tape, rock play-record head (9) back and forth, loosening two screws (1) will allow you to do this, and notice a variation in the output voltage at the voice coil. Tighten screws (1) in the position of highest output.

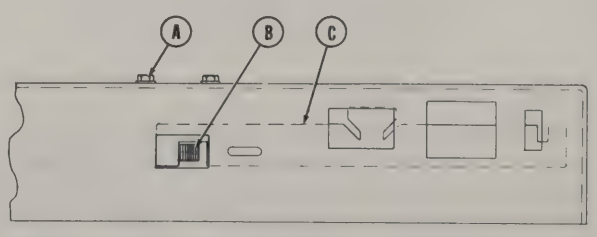

Figure 7

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Memory Switch Adjustment-
(To Correct Imbalance In Braking)-

Remove amplifier chassis from case. Just above toggle on front of amplifier are two nuts (A) (See Fig. 7). Loosen these two nuts. Press the "Rewind" button to the bottom. Pull toggle of (B) to extreme right on switch assembly. Position entire switch assembly with left side of toggle just touching the latch bar (C) as shown in Fig. 7, then tighten the two nuts (A).

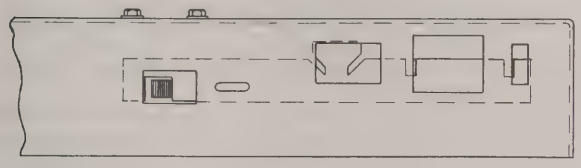

Figure 8

To check the adjustment, press the "Forward" button and observe new position of the toggle. It should then be in the extreme left position with the latch bar just touching the right side of the toggle as shown in Fig. 8.

LUBRICATION

The Columbia-Bell & Howell has been lubricated at time of manufacture and this should be sufficient for the life of the recorder. In case of extreme use or if parts are replaced, spread a thin film of Lubriplate on the pivot points of levers. Parts such as pressure roller (27), idler wheel (40), and flywheel assembly (56) are provided with generous-size oilite bearings and require no further attention.

CAUTION: Do not oil the motor bearings unless absolutely necessary as excess oil will only be thrown off and get on the pulleys and rollers. Always use as little oil as possible. If any oil should get on the pulleys or rollers wipe off with a petroleum solvent, such as alcohol.

CLEANING

The erase head, play/record head, capstan, and pressure roller are subject to an accumulation of tape coating oxide which is worn off the tape as it passes these parts. If left unattended the playing and recording qualities of the recorder will be affected. Periodically clean these surfaces with a soft cloth and alcohol.

TROUBLE CHART

SYMPTOM	CAUSE	REMEDY
Broken reel spring (4).	Defective spring (4).	Replace spring. Turn spindle (7 or 17) until spring is on top of spindle. With long end of #8 allen wrench reach over spindle motor, locate and engage head of allen set screw (6) in top of hub between motor and Mechanical Housing (28). Give allen wrench one-half turn to left to loosen screw and pull out broken spring from the top of Mechanical Housing (28). Insert new spring and tighten set screw. NOTE: When placing new spring in position- push all the way in, then back out about 1/32" before tightening allen set screw.
Tape reel rubs on front panel.	Spindle hub (7-17) out of alignment.	(a)Remove reel spring (4), as above. (b)Turn spindle until reel spring slot is under spindle. With #8 allen wrench reach over spindle motor, locate and engage head of allen set screw in hub between motor and front panel. Give allen wrench one-half turn to left to loosen screw. (c)Slide hub slightly outward on spindle away from front panel and tighten set screw. Put empty reel on spindle and check for clearance between reel and panel and also for alignment of reel hub with tape feed from capstan. (d)Install reel spring (see "Replace Spring" above).
Take-up or Rewind sluggish or inoperable.		IMPORTANT: Tape is an elastic meduim of recording. Stretching this tape will introduce "wow" and "flutter" (distortion) for in excess of the design specifications to which the recorder is manufactured. Fast tape transport in both directions is a highly desirable feature but must not be achieved at the sacrifice of fidelity of the

SYMPTOM	CAUSE	REMEDY
		recorded tape. For this reason the "take-off" must be a gentle action with positive control of the transport function particularly at the ends of the tape. NOTE: A full 7" reel of 1200 feet of tape can be transported in either direction in about 40 seconds. Due to the gentle take-off action a slight manual assistance may be necessary to start the reels. By this means positive control is maintained and the tape may be repositioned at any point with great accuracy and with no loss of overall fidelity.
Takeup or Rewind sluggish (continued).	1. Low supply voltage.	1. Check line voltage. Should be between 105 and 125 volts AC.
	2. Drive Belt (59) between take-up motor and PROGRAM INDICATOR odometer pulley is too tight.	2. Stretch drive belt (59) slightly.
	3. Defective odometer.	3. Remove drive belt (59) from odometer pulley (64) and turn pulley with fingers through several revolutions. If pulley does not turn freely at any point of revolution replace odometer.
	4. Spindle motor bearing out of Alignment due to rough handling during shipment.	4. Tap end of spindle sharply with wooden or plastic handle of screwdriver.
Tape speed erratic.	1. Capstan drive slipping due to oil or dirt on drive surfaces.	1. Clean drive surface using a small lintless, soft cloth (cheesecloth or equivalent) dipped lightly in carbon tetrachloride, alcohol, or lighter fluid. With drive running, hold cloth against motor drive wheel (34), idler wheel (40), and capstan flywheel (56).
	2. Tape wound around capstan; oil or dirt on pressure roller.	2. Remove two screws in front or recording-head cover plate (5). If tape is wound around capstan peel or cut it off. CAUTION: Be extremely careful not to scratch or mar surface of capstan. Use soft cloth dipped in carbon tetrachloride, alcohol, or lighter fluid to clean surface of capstan and pressure roller. Use pipe-stem cleaner dipped lightly in one of above fluids to wipe off any tape dust from face of brush "redheads". Replace cover plate and screws. NOTE: Do not turn screw in too tightly.
Hum in playback.	1. Congested wiring.	1. Separate wires in back of recorder to make certain none comes against moving parts. Check that all plug-in connections are securely in place. Reverse the power cord plug in wall socket.
	2. Recorded signal lever too low.	2. Press "PLAY" button and set "VOLUME" for preferred listening level. Place "SPEED CHANGE" knob in "NEUTRAL" (between the 3 3/4 and 7 1/2 ips.) Hum should disappear indicating too low an input signal lever was used for recording. Set proper input level when recording. NOTE: It should never be necessary to raise the "VOLUME" control setting above "3" or "4" when recording. If hum persists observe the following:

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SYMPTOM	CAUSE	REMEDY
	3. AC hum pickup from power equipment (transformers), fluorescent fixtures, etc.	3. Avoid operating the recorder in the proximity of such devices and/ or provide a good electrical ground for the amplifier chassis.
	4. Hum pickup from associated signal equipment.	4. (a)Switch input connections. (b)Provide a common metallic bond between all associated equipment and ground system securely. (c)If signal output voltage of associated equipment is characteristically low use shielded lead between signal source and recorder input.
	5. Defective vacuum tube.	5. Check and replace faulty tube.
Does not erase properly.	Pressure Pad Worn.	Remove recording-head cover plate (5) and examine felt pad on pressure levers. Replace if worn. Peel off old pads and mount new ones (from envelope stapled in Instruction book) using Du Pont clear cement or equivalent.
Does not record properly.	1. Faulty operating procedure.	1. Refer to "Operating Instructions". Also observe "REMEDY" column under "Hum In Playback" of this chart.
	2. Pressure pad worn.	2. Examine for worn pads and replace if necessary (see replacement directions above).
	3. Distorted recording.	3. Try recording with microphone supplied with the recorder. If clean recording can be made with "mike" check for mismatched impedance in hookup of associated equipment.

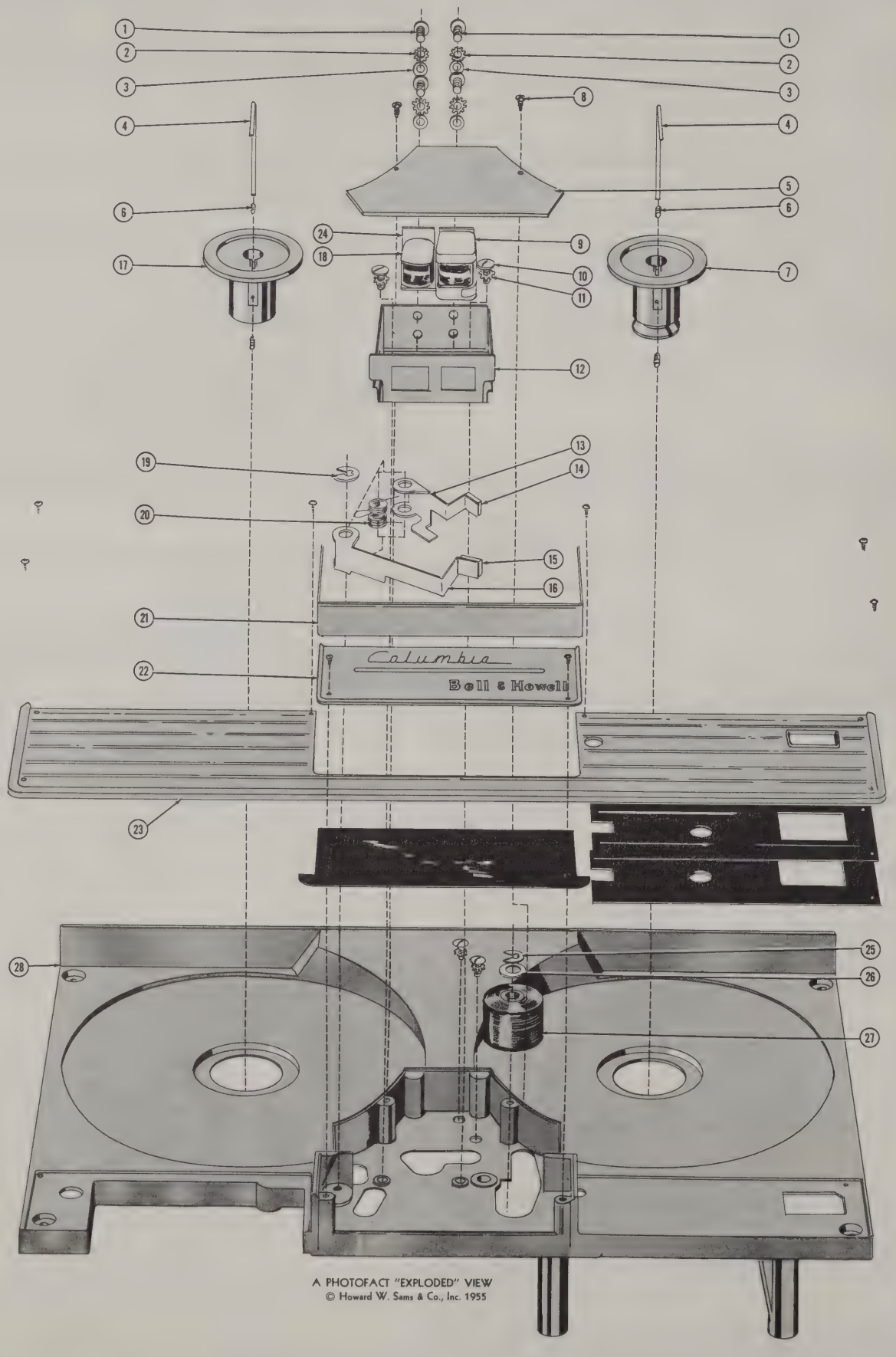

Figure 9A. Exploded View Of Parts Above Baseplate.

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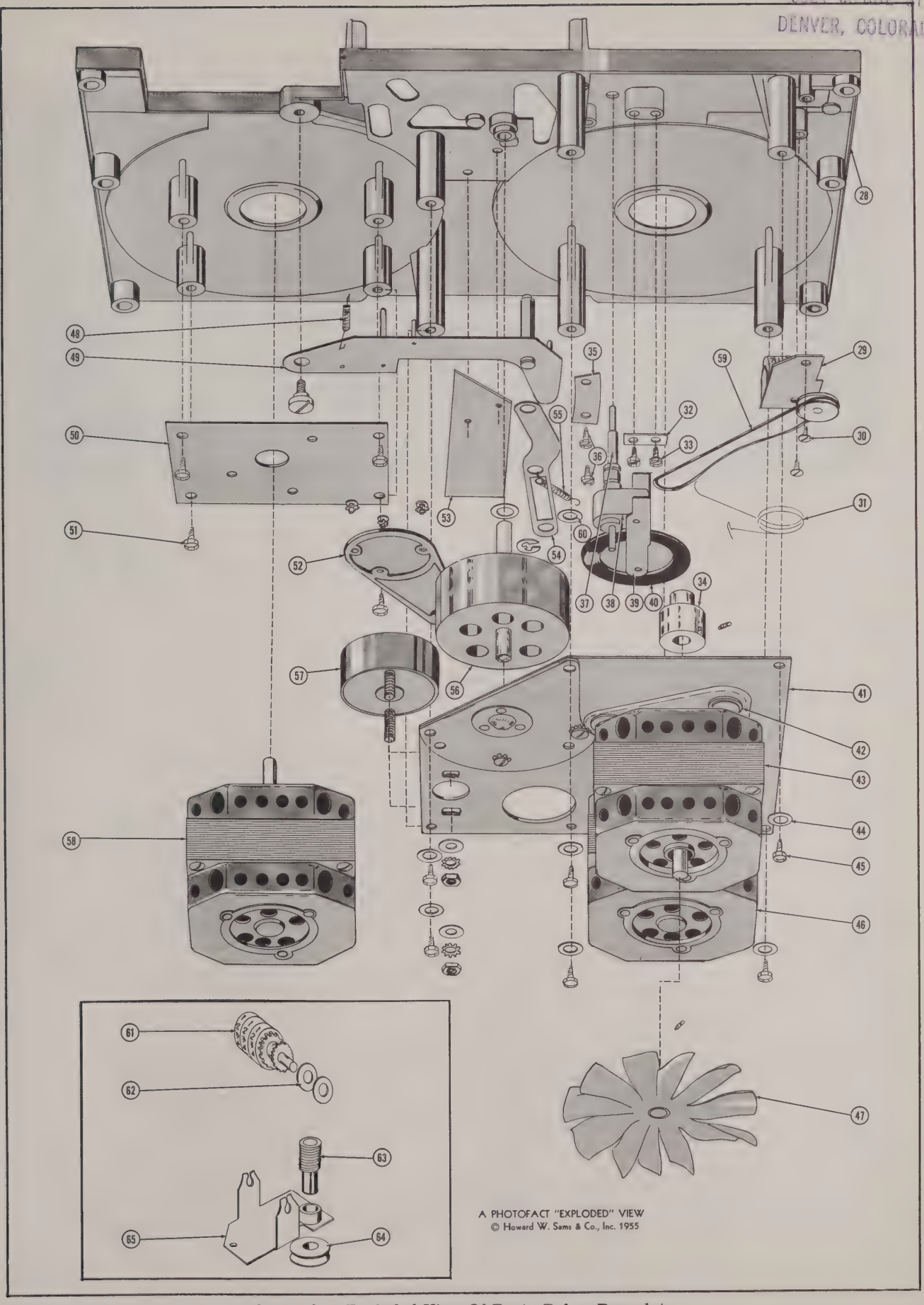


Figure 9B. Exploded View Of Parts Below Baseplate.

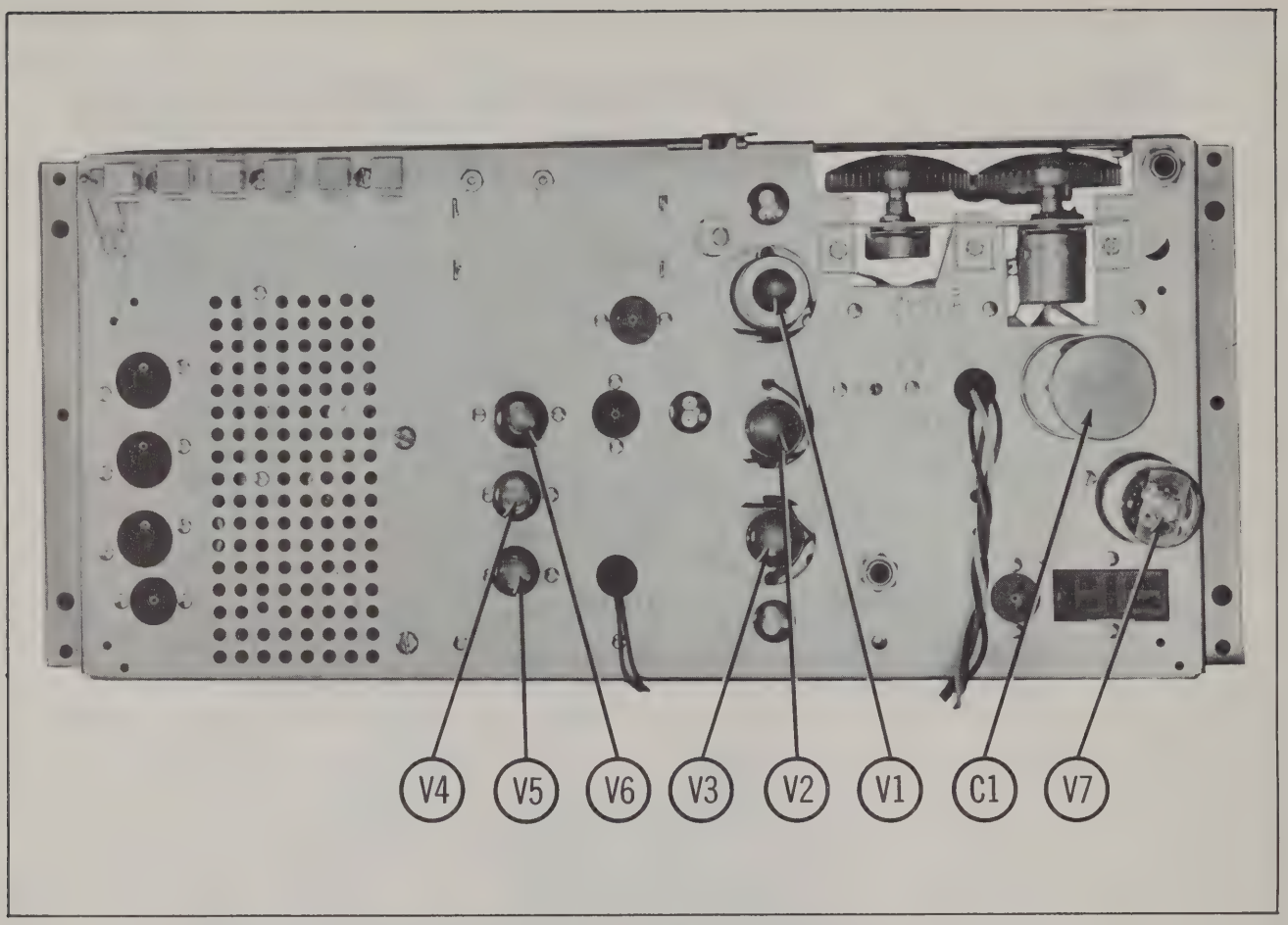
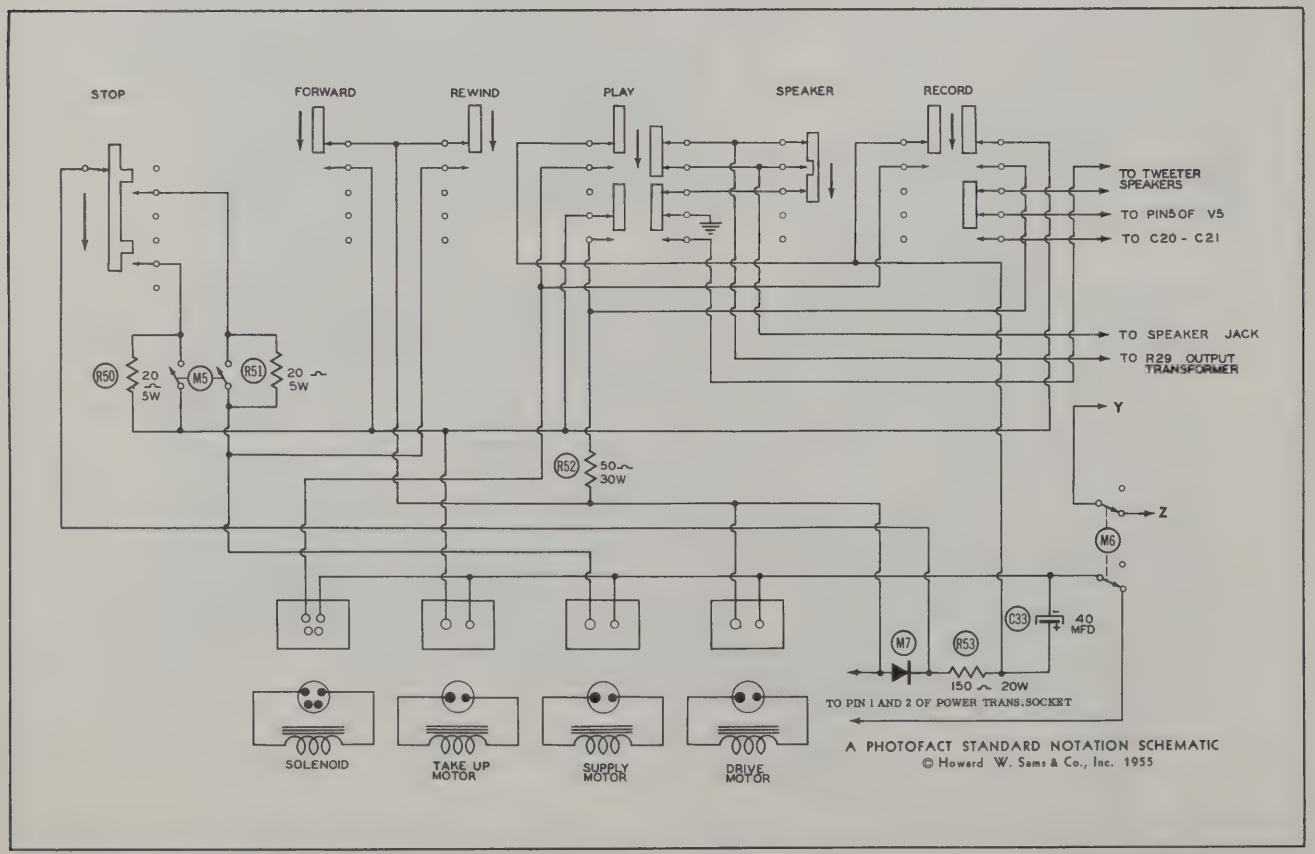
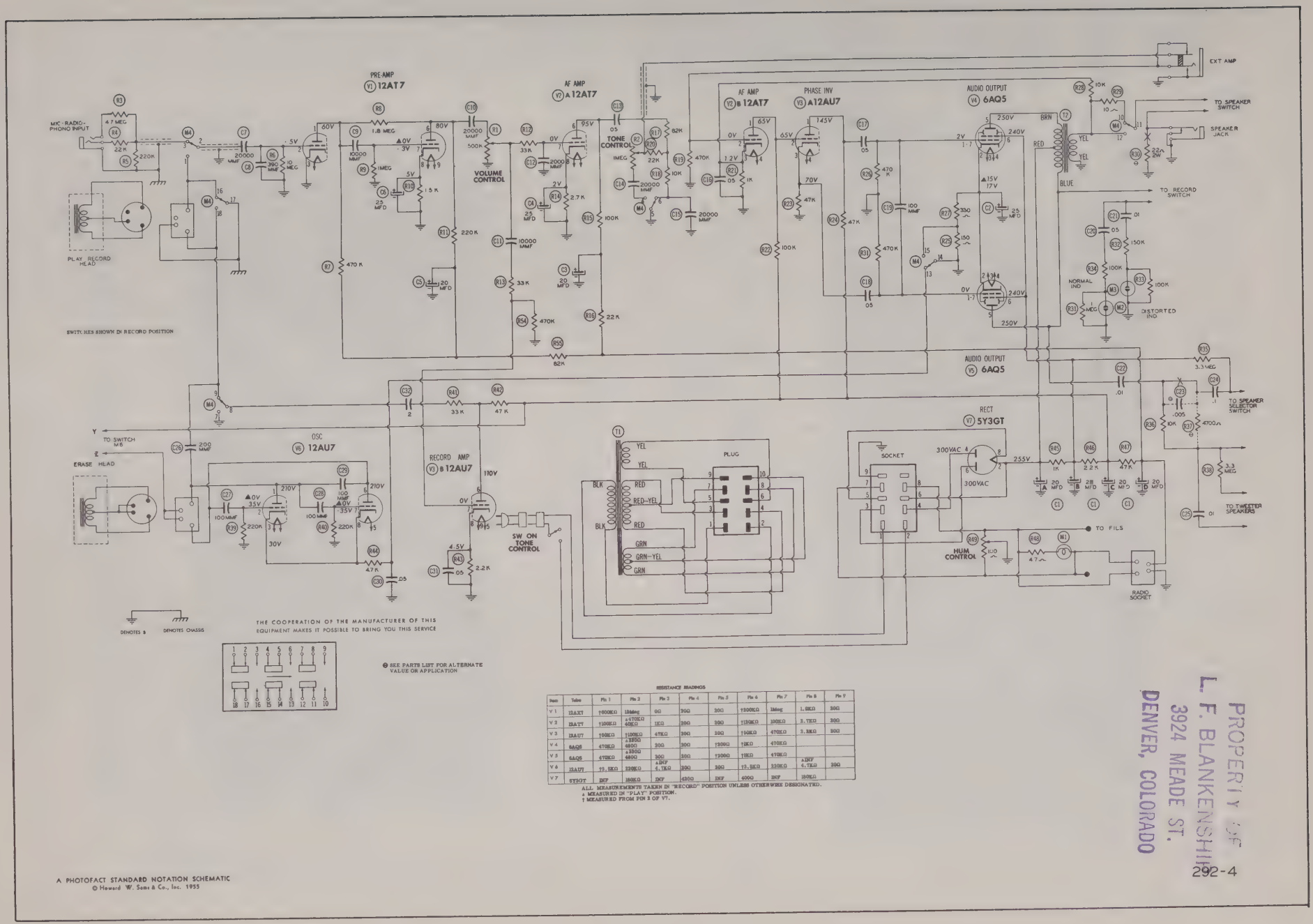


Figure 10



AC WIRING DIAGRAM



RESISTANCE READINGS

Item	Tube	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8	Pin 9
V 1	12AT7	†800KΩ	1Meg	0Ω	30Ω	30Ω	†300KΩ	1Meg	1.8KΩ	30Ω
V 2	12AT7	†105KΩ	▲470KΩ 605Ω	1KΩ	30Ω	30Ω	†132KΩ	100KΩ	3.7KΩ	30Ω
V 3	12AU7	†50KΩ	†100KΩ	47KΩ	30Ω	30Ω	†56KΩ	470KΩ	2.8KΩ	30Ω
V 4	6AQ5	470KΩ	▲185Ω 680Ω	30Ω	30Ω	†200Ω	†2KΩ	470KΩ		
V 5	6AQ5	470KΩ	▲330Ω 680Ω	30Ω	30Ω	†200Ω	†1KΩ	470KΩ		
V 6	12AU7	†3.5KΩ	320KΩ	▲INF 4.7KΩ	30Ω	30Ω	†3.5KΩ	220KΩ	▲INF 4.7KΩ	30Ω
V 7	5Y3GT	INF	180KΩ	INF	430Ω	INF	600Ω	INF	180KΩ	

ALL MEASUREMENTS TAKEN IN "RECORD" POSITION UNLESS OTHERWISE DESIGNATED.
▲ MEASURED IN "PLAY" POSITION.
† MEASURED FROM PIN 3 OF V7.

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DENVER, COLORADO

292-4

COLUMBIA-BELL & HOWELL
MODEL 355

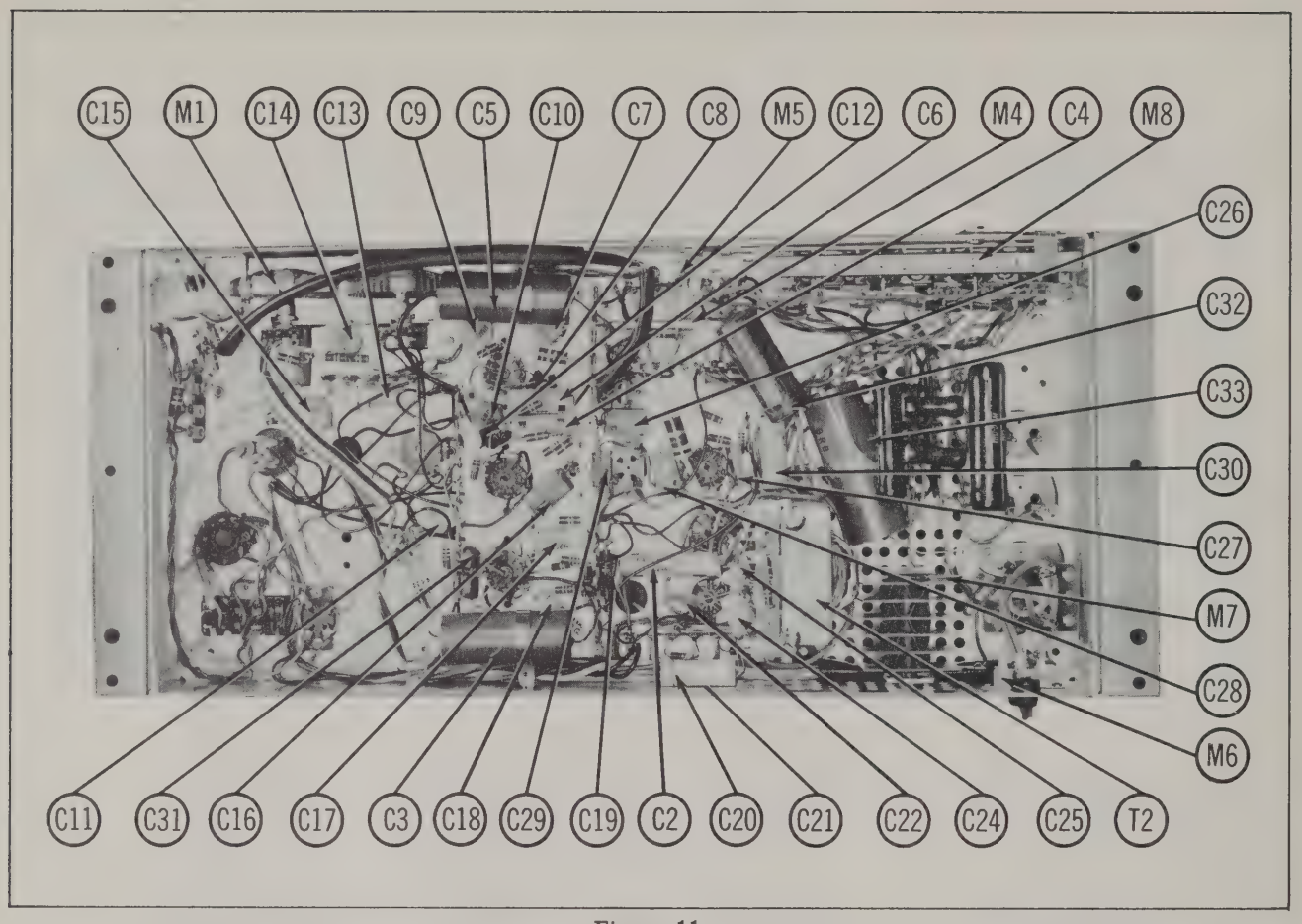

Figure 11

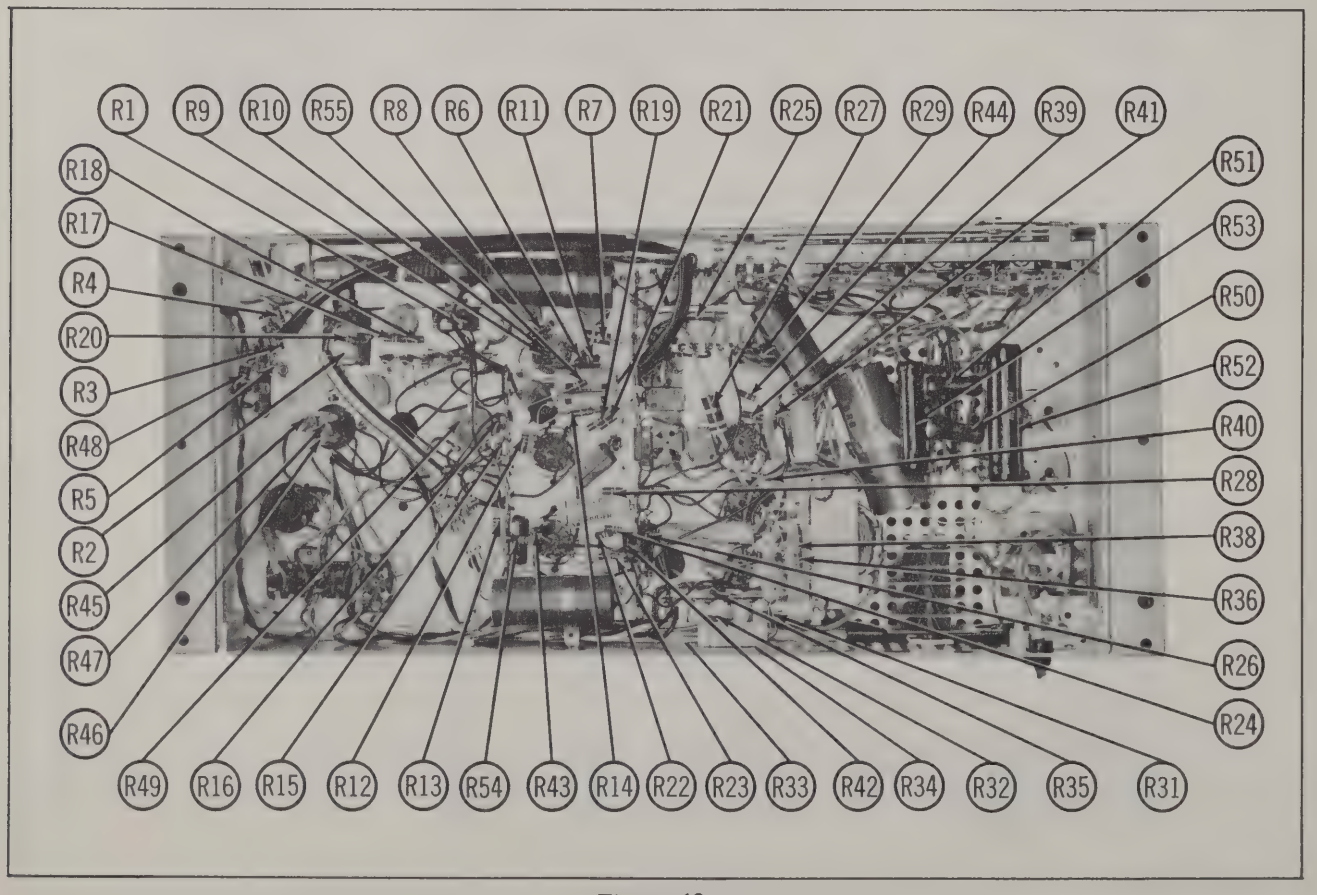

Figure 12

ELECTRICAL PARTS LIST

Ref. No.	Part No.	Description
V1	93-2	12AT7, Pre-Amp.
V2	93-2	12AT7, AF Amp.
V3	93-3	12AU7, Phase Inv. & Record Amp.
V4	93-4	6AQ5, Output
V5	93-4	6AQ5, Output
V6	93-3	12AU7, Oscillator
V7	93-5	5Y3GT, Rectifier
C1A	98-10	Elect. Cap., 20MFD. @450V.
C1B		Elect. Cap., 20MFD. @450V.
C1C		Elect. Cap., 20MFD. @450V.
C1D		Elect. Cap., 20MFD. @450V.
C2	98-21	Elect. Cap., 25MFD. @50V.
C3	98-26	Elect. Cap., 20MFD. @350V.
C4	98-18	Elect. Cap., 25MFD. @6V.
C5	98-19	Elect. Cap., 20MFD. @350V.
C6	98-18	Elect. Cap., 25MFD. @6V.
C7	98-30	Cap. Ceramic, 20, 000MMF. @10%
C8	98-17	Cap. Ceramic, 390MMF. @500V.
C9	98-15	Cap. Ceramic, 10, 000MMF. @500V.
C10	98-7	Cap. Ceramic, 20, 000MMF. @10%
C-11	98-15	Cap. Ceramic, 10, 000MMF. @10%
C-12	98-6	Cap. Ceramic, 2, 000MMF. @10%
C-13	98-8	Cap. Molded, .05MFD. @400V.
C-14	98-7	Cap. Ceramic, 20, 000MMF. @10%
C-15	98-7	Cap. Ceramic, 20, 000MMF. @10%
C-16	98-20	Cap. Paper Tub., .05MFD. @150V.
C-17	98-8	Cap. Molded, .05MFD. @400V.
C-18	98-8	Cap. Molded, .05MFD. @400V.
C-19	98-12	Cap. Mica, 100MMF. @10%
C-20	98-8	Cap. Molded Paper, .05MFD @400V.
C-21	98-22	Cap. Molded Paper, .01MFD @400V.
C-22	98-15	Cap. Ceramic, 10, 000MMF. @500V.
C-23	98-29	Cap. Ceramic, 5, 000MMF. @10%(Not used in all Models)
C-24	98-28	Cap. Molded Paper, .1MFD. @150V.
C-25	98-15	Cap. Ceramic, 10, 000MMF. @500V.
C-26	98-24	Cap. Mica, 200MMF. @10%
C-27	98-12	Cap. Mica, 100MMF. @10%
C-28	98-12	Cap. Mica, 100MMF. @10%
C-29	98-12	Cap. Mica, 100MMF. @10%
C30	98-8	Cap. Molded Paper, .05MFD. @400V.
C31	98-20	Cap. Molded Paper, .05MFD. @150V.
C32	98-23	Cap. Paper Tub., .2MFD. @600V.
C33	98-14	Elect. Cap., 40MFD. @350V.
R1	99-35	Vol. Control, 500KΩ
R2	99-64	Tone Control, & Sw., 250KΩ
R3	99-3	Resistor, 4.7Meg. @1/2 W.
R4	99-2	Resistor, 22KΩ@1/2 W.
R5	99-1	Resistor, 220KΩ@1/2 W.
R6	99-6	Resistor, 10Meg. @1/2 W.
R7	99-7	Resistor, 470KΩ@1 W.
R8	99-60	Resistor, 1.8Meg. @1/2 W.
R9	99-10	Resistor, 1Meg. @1/2 W.
R10	99-39	Resistor, 1.5KΩ@1/2 W.
R11	99-1	Resistor, 220KΩ@1/2 W.
R12	99-22	Resistor, 33KΩ@1/2 W.
R13	99-22	Resistor, 33KΩ@1/2 W.
R14	99-9	Resistor, 2.7KΩ@1/2 W.
R15	99-8	Resistor, 100KΩ@1/2 W.
R16	99-2	Resistor, 22KΩ@1/2 W.
R17	99-11	Resistor, 82KΩ@1/2 W.
R18	99-14	Resistor, 10KΩ@1/2 W.
R19	99-17	Resistor, 470KΩ@1/2 W.
R20	99-2	Resistor, 22KΩ@1/2 W.
R21	99-44	Resistor, 1KΩ@1/2 W.
R22	99-8	Resistor, 100K@1/2 W.
R23	99-55	Resistor, 47Ω@1/2 W.
R24	99-55	Resistor, 47KΩ@1/2 W.
R25	99-19	Resistor, 150Ω@1 W.
R26	99-7	Resistor, 470KΩ@1/2 W.
R27	99-40	Resistor, 330Ω@2 W.
R28	99-14	Resistor, 10KΩ@1/2 W.
R29	99-21	Resistor, 10Ω@2W.
R30	99-62	Resistor, 22Ω@2W. (Not used in all models)
R31	99-10	Resistor, 1Meg. @1/2 W.
R32	99-16	Resistor, 150KΩ@1/2 W.
R33	99-8	Resistor, 100KΩ@1/2 W.
R34	99-8	Resistor, 100KΩ@1/2 W.
R35	99-65	Resistor, 3.3Meg. @1/2 W.
R36	99-14	Resistor, 10KΩ@1/2 W.
R37	99-41	Resistor, 4.7KΩ@1/2 W.(Not used in all models)
R38	99-65	Resistor, 3.3Meg. @1/2 W.
R39	99-1	Resistor, 220KΩ@1/2 W.
R40	99-1	Resistor, 220KΩ@1/2 W.
R41	99-22	Resistor, 33KΩ@1/2 W.
R42	99-20	Resistor, 47KΩ@1/2 W.
R43	99-56	Resistor, 2.2KΩ@1/2 W.
R44	99-41	Resistor, 4.7KΩ@1/2 W.
R45	99-43	Resistor, 1KΩ@2 W.
R46	99-42	Resistor, 2.2KΩ@2 W.
R47	99-33	Resistor, 4.7KΩ@1 W.
R48	99-29	Resistor, 4.7Ω@1 W.
R49	99-15	Hum Balance Cont., 100Ω
R50	99-37	Resistor, 20Ω@5 W., W. W.
R51	99-37	Resistor, 20Ω@5 W., W. W.
R52	99-57	Resistor, 50Ω@30W., W. W.
R53	99-5	Resistor, 150Ω@20W., W. W.
R54	99-7	Resistor, 470KΩ@1/2 W.
R55	99-11	Resistor, 82KΩ@1/2 W.
T1	130-3	Power Transformer
T2	130-4	Output Transformer
M1	91-17	Pilot Lamp, TS47
M2	87-61	Neon Lamp, NE51, Normal Ind.
M3	87-61	Neon Lamp, NE51, Distorted Ind.
M4	86-18	Play-Record Slide Switch
M5	86-19	Memory Switch Assy.
M6	86-20	Tape Drive Switch
M7	130-6	Selenium Rectifier
M8	86-22	Push Button Switch Assy.

MECHANICAL PARTS LIST

Ref. No.	Part No.	Description
1	3-2	Screw-Bd. Hd. #5-40 x 3/16
2	63-1	Washer-#5 Ext. Tooth
3	61-34	Washer- 9/64 x 1/4 x .031
4	188-10	Spring-Reel
5	188-24	Panel-Record Head Cover
6	41-2	Screw-Set #8-32 x 1/4
7	188-47	Disc-Takeup Spindle
8	11-13	Screw Rd. Hd. Thd. Cut#2-56 x 3/16
9	188-37	Record-Play Head
10	3-4	Screw-Bd. Hd. #6-32 x 1/4
11	63-4	Washer-#6 Ext. Tooth
12	130-202	Tape Guide
13	130-246	Erase Arm
14	130-330	Erase Head Pad
15	130-273	Record Head Pad

Ref. No.	Part No.	Description
16	130-247	Record and Play Arm
17	188-46	Disc-Rewind Spindle
18	188-38	Erase Head
19	82-7	E-Ring
20	130-209	Spring-Double Torsion
21		Nameplate Support
22	355-2	Nameplate- Logo
23	188-6	Escutheon Cabinet
24	130-282	Head Bracket
25	82-7	E-Ring
26	130-207	Washer-Pressure Roller
27	130-264	Roller-Pressure
28	130-M-235	Mech Housing
29	130-S-11	Counter Assembly
30	13-1	Screw-Bd. Hd. Self. Tap. #6-32 x 1/4
31	188-15	Spring-Idler
32	130-206	Speed Changer Shaft Stop
33	18-22	Screw-Hex Hd. Self T. #6-32 x 5/16
34	130-231	Drive Motor Pulley
35	130-296	Roller Plate Guide
36	18-22	Screw-Hex Hd. Self T. #6-32 x 5/16
37	130-212	Speed Changer Shaft
38	130-278	Idler Crank
39	130-211	Idler Link
40	130-263	Idler Wheel
41	130-210	Motor Mounting Plate
42	89-10	Shock Mount (Lord)
43	90-27	Drive Motor
44	61-39	Washer-3/16 x 7/16 x .032
45	18-25	Screw-Hex. Hd. Self T. #8-32 x 1/2
46	90-29	Take Up Motor
47	188-58	Fan-4"(5/16 ID hub)Ventilating
48	188-52	Roller Plate Spring
49	130-201	Pressure Roller Plate
50	130-285	Rewind Motor Mounting Plate
51	18-23	Screw-Hex Hd.Self Tap. #8-32 x 5/16
52	130-S-46	Solenoid Arm & Pin Assembly
53	130-323	Hum Shield
54	130-240	Solenoid Link
55	188-63	Solenoid Link Spring
56	13-S-14	Flywheel Assembly
57	130-254	Solenoid
58	90-38	Rewind Motor
59	130-265	Counter Belt
60	61-9	Washer-Plain. 265 x 1/2 x .030
61	130-S-11	Counter Assembly
62	67-9	Spring Washer (3/16 x 3/8 x .006)
63	130-S-10	Counter Worm Assembly
64	130-252	Counter Pulley
65	130-S-43	Counter Frame & Bearing Assy.

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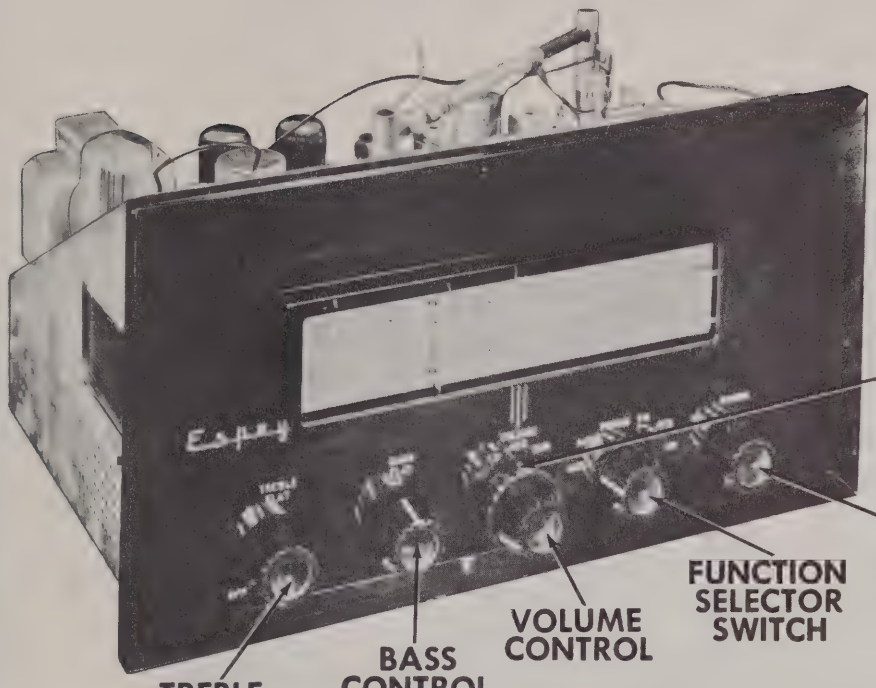

ESPEY
MODEL 710

TRADE NAME	Espey Model 710		
MANUFACTURER	Espey Mfg. Co., Inc., 528 E. 72nd St., New York 21, N. Y.		
TYPE SET	AC Operated AM-FM Superheterodyne Receiver For Custom Installation		
TUBES	Seventeen		
POWER SUPPLY	105-125 Volts AC-50/50 Cycles	RATING	1.06 Amp. @ 117 Volts AC
TUNING RANGE-BROADCAST	535KC-1720KC	FREQ. MOD.	88MC-108MC

HOWARD W. SAMS & CO., INC. • Indianapolis 5, Indiana

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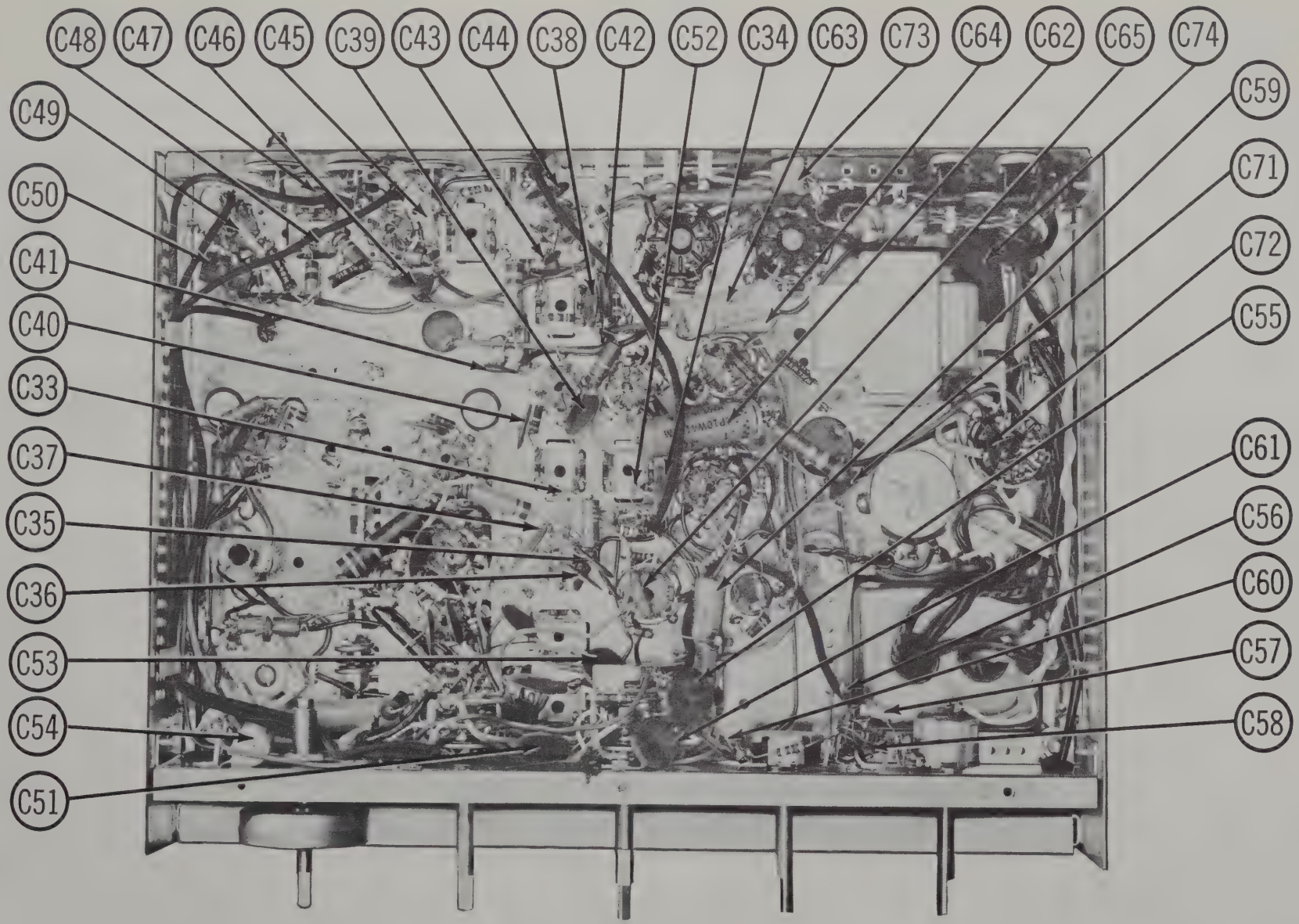
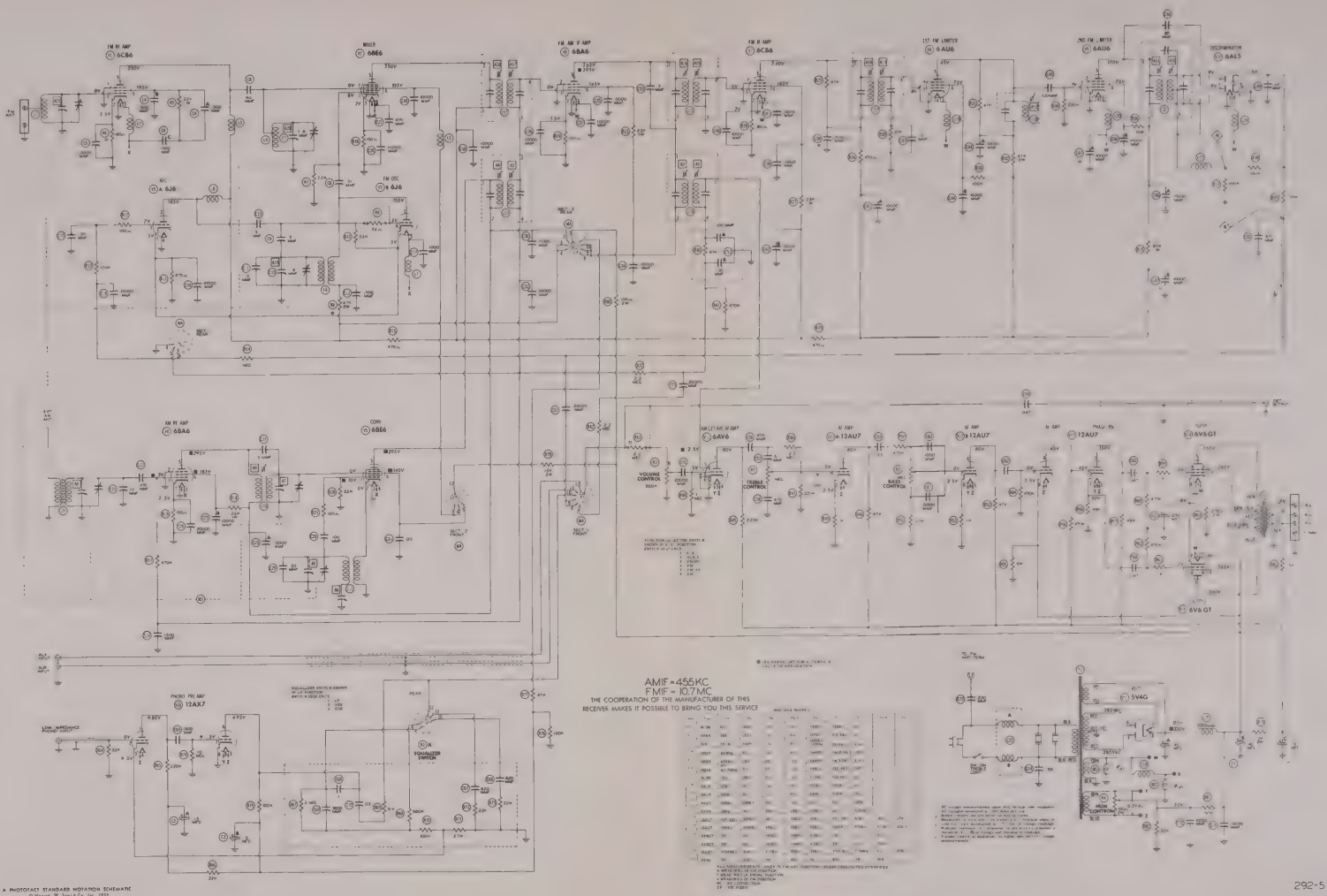


CHASSIS BOTTOM VIEW-CAPACITOR IDENTIFICATION


AMIF = 455KC
FMIF = 10.7MC
THE COOPERATION OF THE MANUFACTURER OF THIS
RECEIVER MAKES IT POSSIBLE TO BRING YOU THIS SERVICE
A PHOTOFACT STANDARD NOTATION SCHEMATIC
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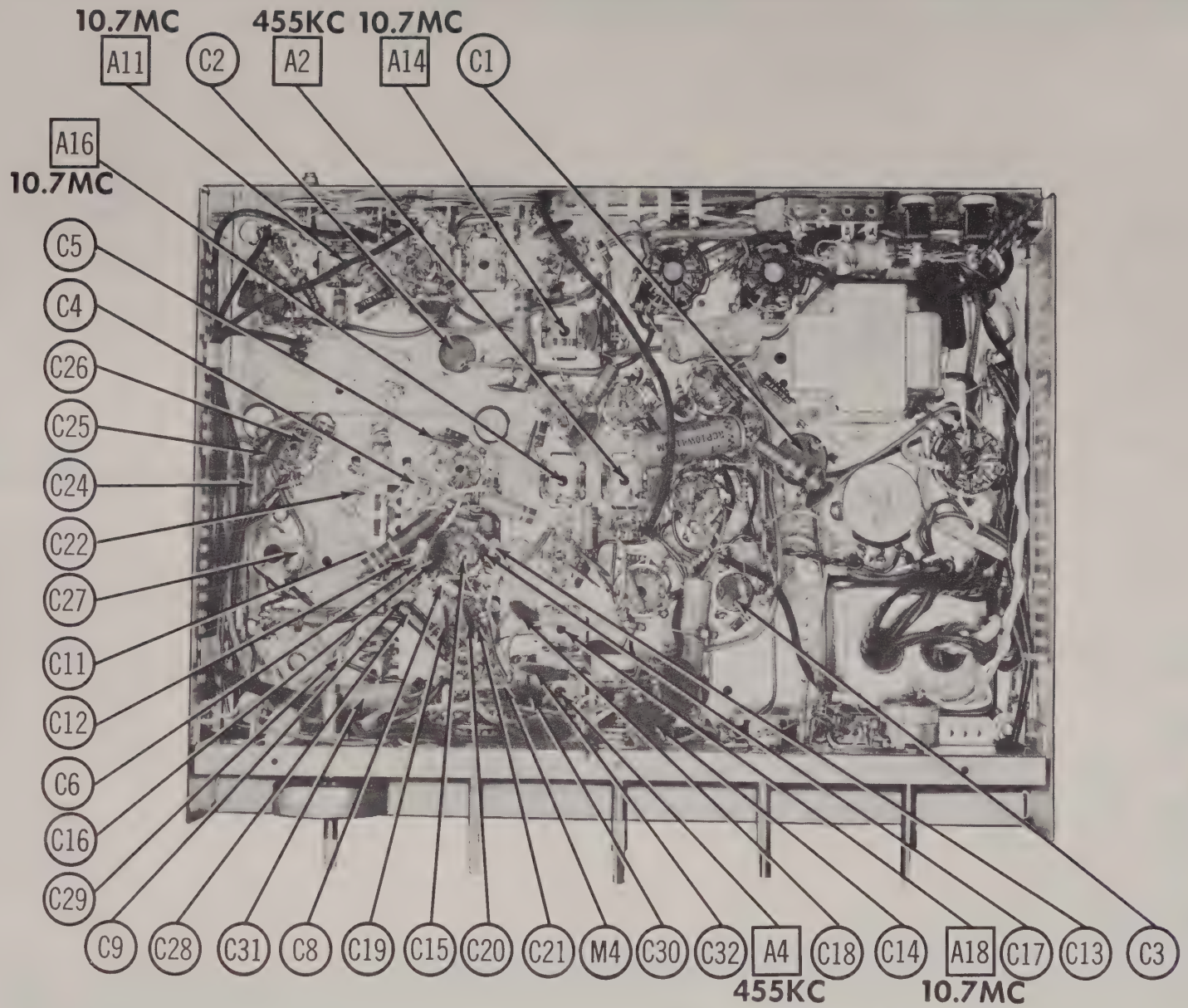
292-5



CHASSIS BOTTOM VIEW-CAPACITOR IDENTIFICATION

PROPERTY OF
L. F. BLANKENSHIP
3304 MEADE ST.
DENVER, COLORADO

ESPEY
Model 710

ALIGNMENT INSTRUCTIONS

ALIGNMENT INSTRUCTIONS—READ CAREFULLY BEFORE ATTEMPTING ALIGNMENT

Allow 15 minute warmup period for receiver & equipment.
Set treble & bass controls to maximum clockwise position.
With tuning gang fully closed set pointer to index mark (small gold mark) to left of "55" on dial.
Volume control should be at maximum position. Output of signal generator should be no higher than necessary to obtain an output reading. Use an insulated alignment screwdriver for adjusting.

AM ALIGNMENT

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	BAND SWITCH POS.	RADIO DIAL SETTING	OUTPUT METER	ADJUST	REMARKS
1.	.01MFD	High side to pin 1 (grid) of 6BA6 (V6). Low side to chassis.	455KC (400∿ Mod.)	AM	Tuning gang fully open.	Across voice coil.	A1, A2	Adjust for maximum output.
2.	"	High side to pin 7 (grid) of 6BE6 (V5). Low side to chassis.	"	"	"	"	A3, A4	"
3.	5MMF	High side to AM antenna terminal. Low side to chassis.	1700KC	"	1700KC	"	A5	"
4.	"	"	550KC	"	550KC	"	A6	Adjust for maximum output. Repeat steps 3 & 4 for proper oscillator tracking.
5.	"	"	1500KC	"	Tune to 1500KC signal.	"	A7, A8	Adjust for maximum output.
6.	"	"	600KC	"	Tune to 600KC signal.	"	A9	Adjust for maximum output. Repeat steps 5 & 6 for proper RF tracking.

FM IF ALIGNMENT USING AM SIGNAL GENERATOR AND VTVM

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	BAND SWITCH POS.	RADIO DIAL SETTING	CONNECT VTVM	ADJUST	REMARKS
7.	.01MFD	High side to pin 7 (grid) of 6BE6 (V2). Low side to chassis.	10.7MC (Unmod.)	FM	Point of non-interference	DC probe to point (A). Common to chassis.	A11, A12 A13, A14 A15, A16 A17, A18	Adjust for maximum deflection.
8.		"	"	"	"	DC probe to point (B). Common to chassis.	A10	Adjust for zero reading. A positive and negative reading will be obtained on either side of the correct setting.

FM IF ALIGNMENT USING FM SIGNAL GENERATOR AND OSCILLOSCOPE

Use frequency modulated signal with 60∿ modulation and 450KC sweep. Use 120∿ sawtooth voltage in scope for horizontal deflection.

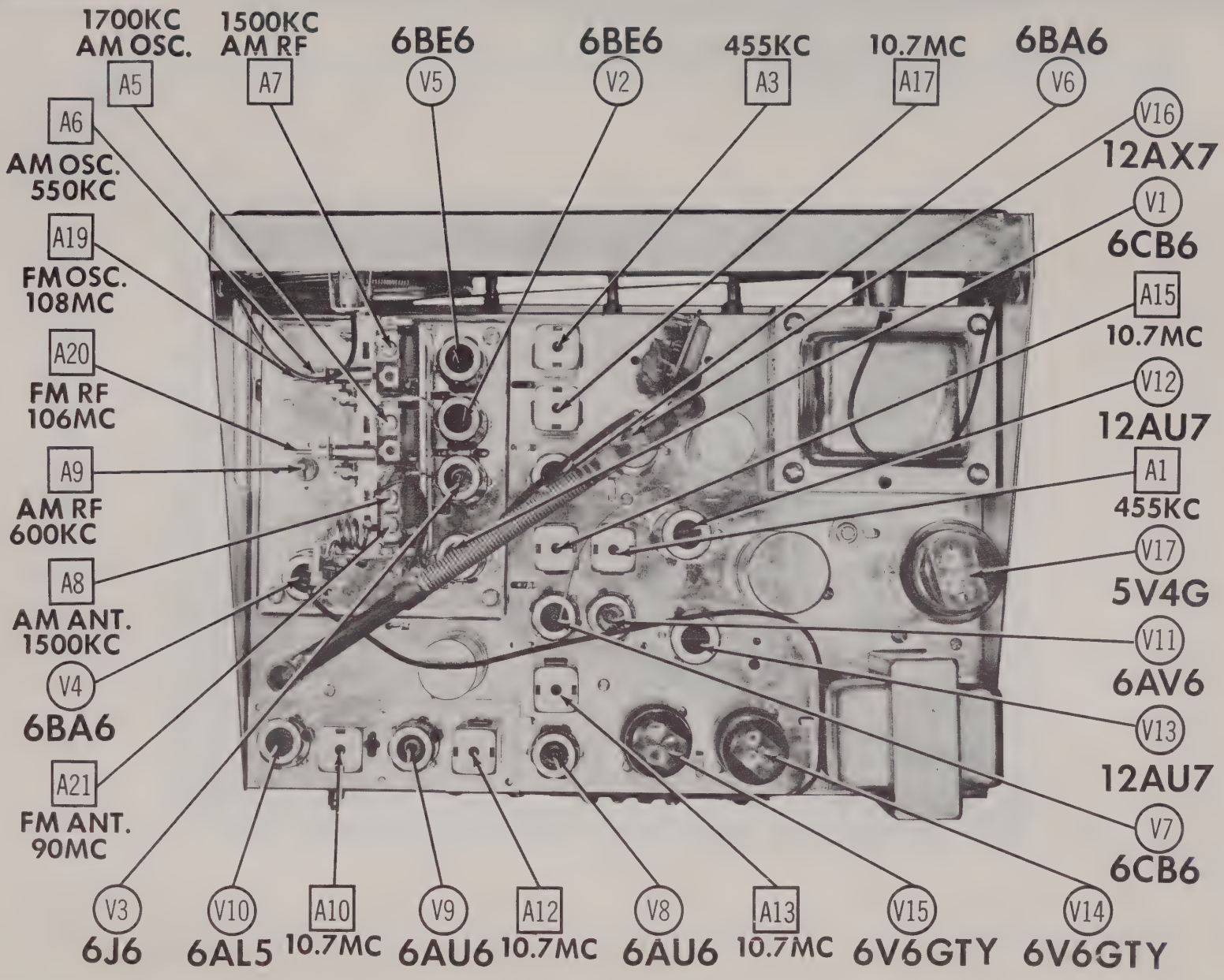
	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	BAND SWITCH POS.	RADIO DIAL SETTING	CONNECT SCOPE	ADJUST	REMARKS
7.	.01MFD	High side to pin 7 (grid) of 6BE6 (V2). Low side to chassis.	10.7MC (450KC Swp)	FM	Point of non-interference	Vert. Amp. to point (A). Low side to chassis.	A11, A12 A13, A14 A15, A16 A17, A18	Adjust for curve of maximum amplitude and symmetry similar to Fig. 1.
8.	"	"	"	"	"	Vert. Amp. to point (B). Low side to chassis.	A10	Adjust so 10.7MC occurs at center of crossover lines similar to Fig. 2. Slightly retouch A11 for maximum amplitude and straightness of crossover lines.

RF ALIGNMENT

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	BAND SWITCH POS.	RADIO DIAL SETTING	CONNECT VTVM	ADJUST	REMARKS
9.	270Ω Carbon Resistor	High side thru 270Ω to FM antenna terminal. Low side to chassis.	108MC	FM	108MC	DC probe to point (A). Common to chassis.	A19	Adjust for maximum deflection.
10.	"	"	106MC	"	106MC	"	A20, A21	"
11.	"	"	90MC	"	90MC	"		Adjust (if necessary) L1 & L4 by compressing or expanding coils for maximum deflection. Repeat steps 9 & 10 for proper RF tracking.

HUM BALANCE ADJUSTMENT

1. Allow 10 minute warmup period with record player disconnected.
2. Set function switch to "phono."
3. Set volume control fully clockwise.
4. Reverse AC line plug, leave in position that gives least hum.
5. Adjust hum balance control (R4A) for minimum hum.



CHASSIS TOP VIEW

ESPEY
Model 710

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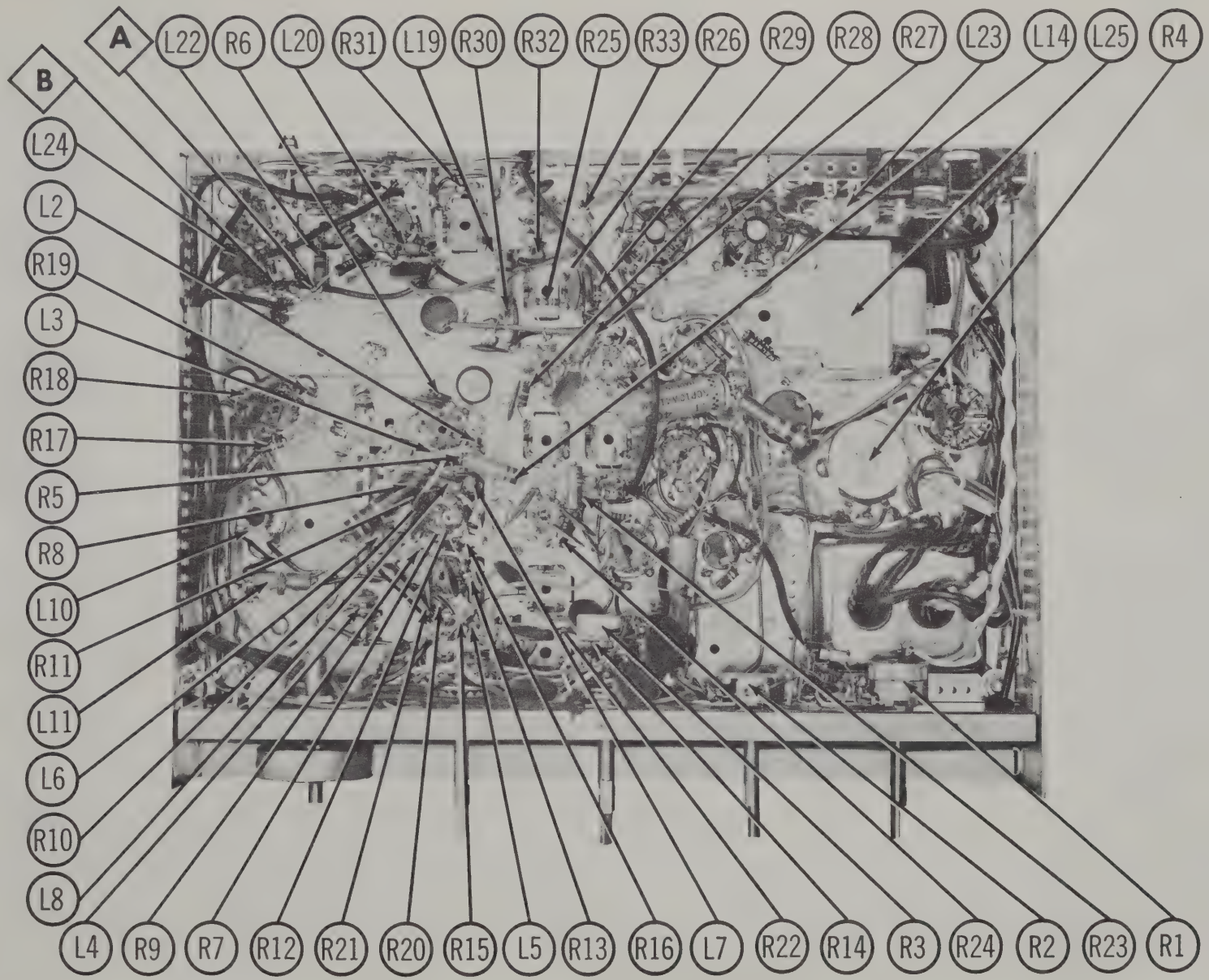
L. F. BLANKENSHIP
3924 MEADE ST.
DENVER, COLORADO



CHASSIS BOTTOM VIEW-RESISTOR IDENTIFICATION

PROPERTY OF
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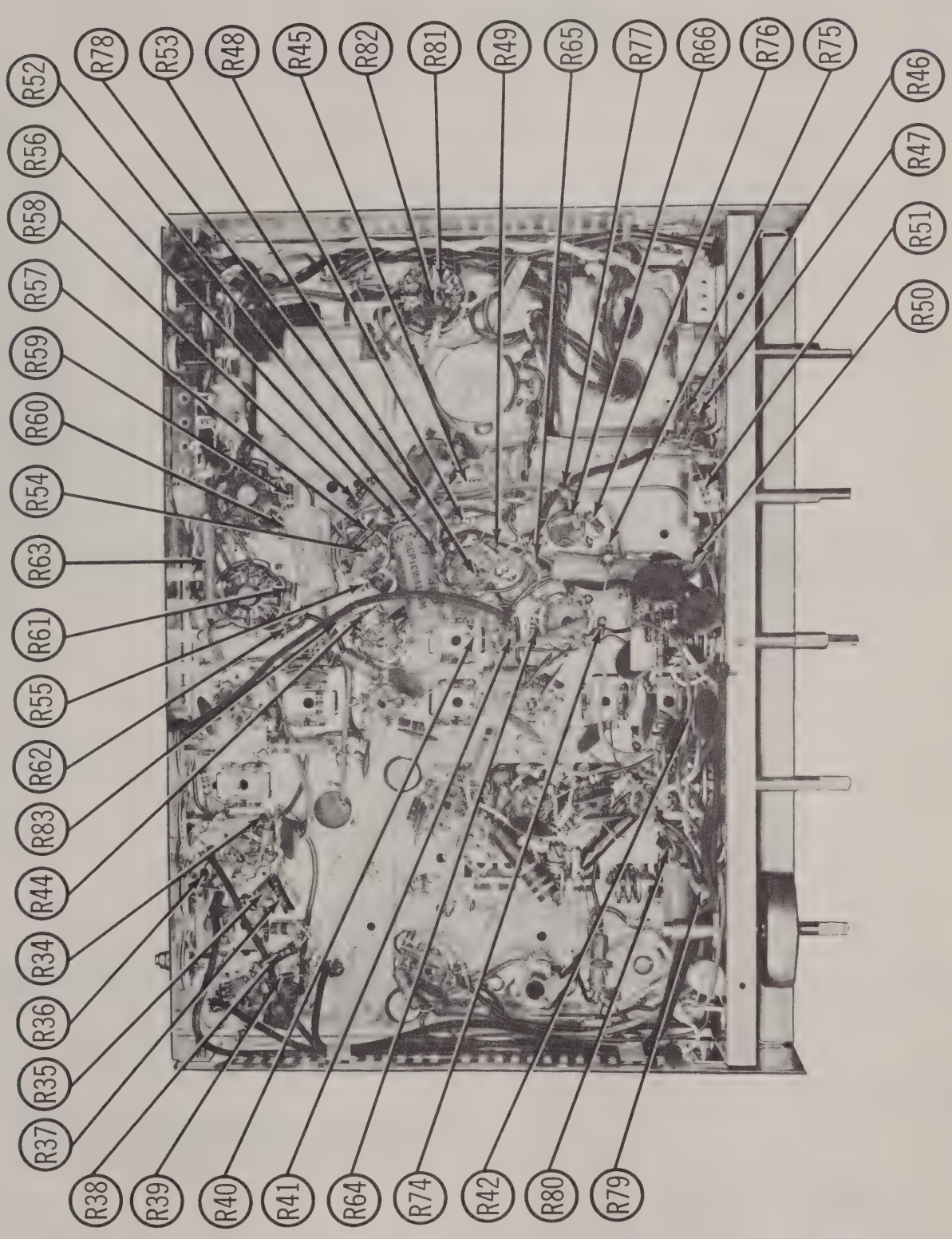
3924 MEADE ST.
DENVER, COLORADO



CHASSIS BOTTOM VIEW-RESISTOR IDENTIFICATION

PARTS LIST AND DESCRIPTIONS

TUBES (SYLVANIA, GENERAL ELECTRIC, WESTINGHOUSE)

ITEM No.	USE	REPLACEMENT DATA: ESPEY PART No.	REPLACEMENT DATA: STANDARD REPLACEMENT	RETMA BASE TYPE	NOTES
V1	FM RF Amp.	6CB6	6CB6	7CM	
V2	FM Mixer	6BE6	6BE6	7CH	
V3	FM Osc. -AFC	6J6	6J6	7BF	
V4	AM RF Amp.	6BA6	6BA6	7BK	
V5	AM Conv.	6BE6	6BE6	7CH	
V6	FM-AM IF Amp.	6BA6	6BA6	7BK	
V7	FM IF Amp.	6CB6	6CB6	7CM	
V8	1st FM Limiter	6AU6	6AU6	7BK	
V9	2nd FM Limiter	6AU6	6AU6	7BK	
V10	Discriminator	6AL5	6AL5	6BT	
V11	AM Det. -AVC-AF Amp.	6AV6	6AV6	7BT	
V12	AF Amp.	12AU7	12AU7	9A	
V13	AF Amp. - Phase Inv.	12AU7	12AU7	9A	
V14	Audio Output	6V6GTY	6V6GTY	7S	
V15	Audio Output	6V6GTY	6V6GTY	7S	
V16	Phono Pre-Amp.	12AX7	12AX7	9A	
V17	Rectifier	5V4G	5V4G	5L	

CAPACITORS

Capacity values given in the rating column are in mfd. for Electrolytic and Paper Capacitors, and in mmfd. for Mica and Ceramic Capacitors.

ITEM No.	RATING CAP.	RATING VOLT	REPLACEMENT DATA: ESPEY PART No.	CENTRALAB PART No.	ERIE PART No.	MALLORY PART No.	PYRAMID PART No.	SANGAMO PART No.	
C1A	40 ▬	450				FP376.8	TM-404010-450	T-165	
B	40 ■	450							
C	10 ▲	450							
C2	250	50					TM-250-50	S-055 MTH-5010	
C3A	15	350				FP345.5	TM-D15-400	D-155	
B	15	350							
C	25	25							Note 1
C4A	1500			D6-152	GP2L-152	UC-5215		C-1215	
B	1500			D6-152	GP2L-152	UC-5215		C-1215	
C	1500			D6-152	GP2L-152	UC-5215		C-1215	
C5	10000			DD-103	811-01	DC511			
C6	40			TCZ-39	NPOL-390				Note 2
C7	1-8			829-7	532-10				
C8	51			TCZ-51	NPO-338-510	ZT-545			
C9	51			TCZ-51	NPO-338-510	ZT-545			
C10	1-8			829-7	532-10				
C11	10			TCZ-10	NPOA-100	ZT-541			
C12	1500			D6-152	GP2L-152	UC-5215		C-1215	
C13	51			TCZ-51	NPO-338-510	ZT-531			
C14	10000			DD-103	811-01	DC511			
C15	100			TCZ-100	NPO-337-101	ZT-531			
C16	10000			DD-103	811-01	DC511			
C17	1000			DD-102	801-001	DC521		K-1210	
C18	10000			DD-103	811-01	DC511			
C19	10000			DD-103	811-01	DC511			
C20	10000			DD-103	811-01	DC511			
C21	470			DD-471	811-471	UC-5347		K-1347	
C22	470			DD-471	811-471	UC-5347		K-1347	
C23	10			TCN-10	N750A-100	NT-541			
C24	1500			D6-152	GP2L-152	UC-5215		C-1215	
C25A	10000			DD3-103	811-01	DC511			
B	10000				811-01	DC511			
C26	20000			DD-203	817-02				
C27	5			TCZ-4R7	NPOA-050	ZT-555			
C28	100			TCZ-100	NPO-337-101	ZT-531			
C29	20								
C30	10000			DD-103	811-01	DC511			
C31	.05	400		DF-503		PT415	IMP4-S5	330415	
C32	20000			DD-203	817-02				
C33	5				NPOA-050	ZT-555			
C34	10000			DD-103	811-01	DC511			
C35	10000			DD-103	811-01	DC511			
C36	10000			DD-103	811-01	DC511			

PARTS LIST AND DESCRIPTIONS (Continued)

CAPACITORS (cont)

ITEM No.	RATING CAP.	RATING VOLT	REPLACEMENT DATA: ESPEY PART No.	CENTRALAB PART No.	ERIE PART No.	MALLORY PART No.	PYRAMID PART No.	SANGAMO PART No.	
C37	10000			DD-103	811-01	DC511			
C38	20000			DD-203	817-02				Note 3
C39	10000			DD-103	811-01	DC511			
C40	10000			DD-103	811-01	DC511			
C41	10000			DD-103	811-01	DC511			
C42A	10000			DD3-103	811-01	DC511			
B	10000				811-01	DC511			
C43	51			TCZ-51	NPO-338-510	ZT-545		KR-1451	
C44A	10000			DD3-103	811-01	DC511			
B	10000				811-01	DC511			
C45	100			TCZ-100	NPO-337-101	ZT531		KR-1310	
C46A	10000			DD3-103	811-01	DC511			
B	10000				811-01	DC511			
C47A	10000			DD3-103	811-01	DC511			Note 4
B	10000				811-01	DC511			Note 4
C48	20			TCZ-20	NPOK-200	ZT-542		KR-1420	
C49	100			TCZ-100	NPO-337-101	ZT-531		KR-1310	
C50	670							KR-1368	
C51	20000			DD-203	817-02	PT412	IMP4-S2	330412	
C52A	100	♦		♦PC-50	♦1403-01	UC-531		K-1310	
B	100					UC-531		K-1310	
C53	20000			DD-203	817-02	PT412	IMP4-S2	330412	
C54	.047	400		DF-503		PT4147	IMP4-S47	3304147	
C55	20000			DD-203	817-02	PT412	IMP4-S2	330412	
C56	470			DD-471	811-471	UC-5347		K-1347	
C57	51			TCZ-51	NPO-338-510	ZT-545		KR-1451	
C58	470			DD-471	811-471	UC-5347		KR-1347	
C59	.03			DF-303		PT413	IMP4-S3	330413	
C60	1000			DD-102	801-001	DC521	IMP6-D1	330621	
C61	10000			DD-103	811-01	DC511	IMP4-S1	330411	
C62	.1	400		DF-104		PT401	IMP4-P1	330401	
C63	.047	400		DF-503		PT4147	IMP4-S47	3304147	
C64	.047	400		DF-503		PT4147	IMP4-S47	3304147	
C65	1500			D6-152	GP2L-152	UC-5215	IMP6-D15	C-1215	
C66	820	500						KR-1382	
C67	820	500						KR-1382	
C68	.1	400		DF-104		PT401	IMP4-P1	330401	
C69	3900	500				MCB463		CR-1239	
C70	.03	400		DF-303		PT413	IMP4-S3	330413	
C71	10000			DD-103	811-01	DC511	IMP4-S1	330411	
C72	10000			DD-103	811-01	DC511	IMP4-S1	330411	
C73	250	500				MC240		K-1325	
C74	.05	500		DF-503		PT415	IMP4-S5	330415	

♦ Items C52A, C52B, and R40 are combined in one unit.

Note 1. Section C2C not used.

Note 2. Some versions may use a 51MMF capacitor in this application.

Note 3. Some versions may use a 10000MMF capacitor in this application.

Note 4. Not used in some versions.

CONTROLS

ITEM No.	RATING RESISTANCE	RATING WATTS	REPLACEMENT DATA: ESPEY PART No.	IRC PART No.	CLAROSTAT PART No.	CENTRALAB PART No.	MALLORY PART No.	INSTALLATION NOTES
R1A	1Meg	½	A9.128	Q13-137	A47-1Meg-Z	B-70-S	U-53	Treble
B	Shaft		Not Req.	Not Req.	FS-3	Not Req.	Not Req.	Attach to R1A
C	Switch		Not Req.	76-1	SWE-12	Not Req.	US-26	Attach to R1A
R2A	1Meg	½	A9.129	Q13-137	A47-1Meg-Z	B-69	U-53	Bass
B	Shaft		Not Req.	Not Req.	FS-3	Not Req.	Not Req.	Attach to R2A
R3A	Switch		B9.311-A					Equalizer (Panel)
B	500KΩ	½	Not Req.					Volume-Attach to R3A (Rear)
R4A	100Ω	2	A9.310-A	W100	A43-100	VK-121	R100L	Hum Balance (Wire Wound)
B	Shaft		Not Req.	Not Req.	FKS-1/4	Not Req.	Not Req.	Attach to R4A

PARTS LIST AND DESCRIPTIONS (Continued)

RESISTORS

ITEM No.	RATING OHMS	RATING WATT	REPLACEMENT DATA ESPEY PART No.	REPLACEMENT DATA IRC PART No.	NOTES
R5	22KΩ	1		BTA-22K	
R6	180Ω 5%	½		BTS-180 5%	Note 1
R7	22KΩ	½		BTS-22K	
R8	4700Ω	2		BTA-4700	Note 2
R9	22Ω 5%	½		BTS-22 5%	
R10	22KΩ	½		BTS-22K	
R11	470Ω	½		BTS-470	
R12	100Ω	½		BTS-100	
R13	100KΩ	½		BTS-100K	
R14	1Meg	½		BTS-1Meg	
R15	470Ω	½		BTS-470	
R16	150Ω	½		BTS-150	
R17	470KΩ	½		BTS-470K	
R18	22KΩ	1		BTA-22K	
R19	100Ω	½		BTS-100	
R20	22KΩ	½		BTS-22K	
R21	150Ω	½		BTS-150	
R22	2.2Meg	½		BTS-2.2Meg	
R23	22K	1		BTA-22K	
R24	100Ω	½		BTS-100	
R25	47KΩ	½		BTS-47K	
R26	470Ω	½		BTS-470	
R27	22KΩ	1		BTA-22K	
R28	180Ω	½		BTS-180	
R29	470Ω	½		BTS-470	
R30	22KΩ	½		BTS-22K	
R31	47KΩ	½		BTS-47K	
R32	47KΩ	2		BTB-47K	
R33	100KΩ	½		BTS-100K	
R34	220KΩ	½		BTS-220K	
R35	47KΩ	1		BTA-47K	
R36	100KΩ	½		BTS-100K	
R37	100KΩ 1%	½		DCC-100K	
R38	100KΩ 1%	½		DCC-100K	
R39	100KΩ	½		BTS-100K	
R40	47KΩ	½	♦	BTS-47K	
R41	470KΩ	½		BTS-470K	
R42	2.2Meg	½		BTS-2.2Meg	
R43	2.2Meg	½		BTS-2.2Meg	Note 3
R44	1Meg	½		BTS-1Meg	
R45	220KΩ	½		BTS-220K	
R46	2.2Meg	½		BTS-2.2Meg	
R47	220KΩ	½		BTS-220K	
R48	47KΩ	½		BTS-47K	
R49	1000Ω	½		BTS-1000	
R50	470KΩ	½		BTS-470K	
R51	47KΩ	½		BTS-47K	
R52	47KΩ	½		BTS-47K	
R53	1000Ω	½		BTS-1000	
R54	470KΩ	½		BTS-470K	
R55	10KΩ	½		BTS-10K	
R56	470KΩ	½		BTS-470K	
R57	48KΩ 1%	½			
R58	48KΩ 1%	½			
R59	1000Ω	½		BTS-1000	
R60	470KΩ	½		BTS-470K	
R61	1000Ω	½		BTS-1000	
R62	470KΩ	½		BTS-470K	
R63	270Ω	2		BTS-270K	
R64	22KΩ	½		BTS-22K	
R65	220KΩ	½		BTS-220K	
R66	22KΩ	½		BTS-22K	
R67	2MegΩ	½		BTS-2Meg	
R68	680KΩ	½		BTS-680K	
R69	5IKΩ	½		BTS-5IK	
R70	100KΩ	½		BTS-100K	
R71	2700Ω	½		BTS-2700	
R72	22KΩ	½		BTS-22K	
R73	22KΩ	½		BTS-22K	
R74	10Meg	½		BTS-10Meg	
R75	100KΩ	½		BTS-100K	
R76	100KΩ	½		BTS-100K	
R77	47KΩ	½		BTS-47K	
R78	10KΩ	2		BTB-10K	
R79	15KΩ	2		BTB-15K	
R80	100Ω	2		BTB-100K	
R81	150KΩ	½		BTS-150K	
R82	22KΩ	½		BTS-22K	
R83	15KΩ 5%	½		BTS-15K 5%	

Note 1. Some versions may use a 150Ω 5% resistor in this application.
Note 2. Some versions may use a 10KΩ, 2W resistor in this application.
Note 3. Not used in some versions.
♦ Items C52A, C52B and R40 are combined in one unit.

TRANSFORMER (POWER)

ITEM No.	RATING PRI.	RATING SEC. 1	RATING SEC. 2	RATING SEC. 3	REPLACEMENT DATA ESPEY PART No.	Halldorson PART No.	Merit PART No.	Stancor PART No.	Thordarson PART No.	Triad PART No.
T1	117VAC ② 1.06A	576VCT .160ADC	5VAC ③ 2A	6.3VAC ② 1.1A SEC 4 6.3VAC ② 4.1A	B18.126					

TRANSFORMER (AUDIO OUTPUT)

ITEM No.	IMPEDANCE PRI.	IMPEDANCE SEC.	REPLACEMENT DATA ESPEY PART No.	Halldorson PART No.	Merit PART No.	Stancor PART No.	Thordarson PART No.	Triad PART No.	NOTES
T2	6.4KΩ CT Tap ③ 160Ω CT RES	16Ω Tap ③ 8Ω ② 4Ω	B15.161						

PARTS LIST AND DESCRIPTIONS (Continued)

COILS (RF-IF)

ITEM No.	USE	DC RES. PRI.	DC RES. SEC.	REPLACEMENT DATA ESPEY PART No.	MEISSNER PART No.	MERIT PART No.	MILLER PART No.	NOTES
L1	FM antenna coil	0Ω						Tapped
L2	Fil. choke	.4Ω			19-1001		4604	1.5UH
L3	RF coil	1Ω			19-1003		4608	3UH
L4	FM RF coil	0Ω						Tapped
L5	RF coil	1Ω			19-1003		4608	3UH
L6	FM Osc. coil	0Ω	0Ω					
L7	Fil. choke	.4Ω			19-1001		4604	1.5UH
L8	RF coil	2.3Ω			19-1003		4608	3UH
L9	AM antenna coil	.3Ω						
L10	AM RF coil	90Ω	2.9Ω		14-1076	BC-388		
L11	AM Osc. coil	.7Ω	6.8Ω		14-1074	BC-394	71 Osc.*	
L12	1st FM IF	.7Ω	.7Ω	2.754	16-3487	FM-254	1463	
L13	1st AM IF	9.5Ω	9.5Ω	2.414	16-6758	BC-352	12-C1	
L14	Fil. choke	.1Ω			19-1001		4604	1.5UH
L15	2nd FM IF	.7Ω	.7Ω	2.754	16-3487	FM-254	1463	
L16	2nd AM IF	9.5Ω	9.5Ω	2.414	16-6758	BC-353	12-C2	
L17	3rd FM IF	.7Ω	.7Ω	2.754	16-3487	FM-254	1463	
L18	FM Limiter	.6Ω		2.755	16-3487■	FM-254■	1463■	
L19	Fil. choke	.1Ω			19-1001		4604	1.5UH
L20	Fil. choke	.4Ω			19-1001		4604	1.5UH
L21	Discriminator	.7Ω	.8ΩCT	2.756	17-3494	FM-253	1464	
L22	RF coil	.4Ω			19-1001		4604	1.2UH
L23A	Line choke	0Ω						
B	Line choke	0Ω						
L24	Fil. choke	.1Ω			19-1001		4604	1.5UH

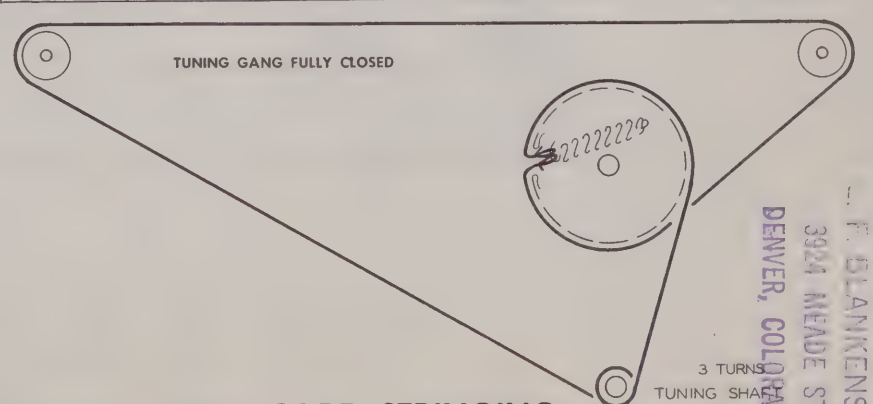
*Drill mounting hole.
■Use ① winding only.

FILTER CHOKE

ITEM No.	RATINGS TOTAL DIRECT CURRENT	RATINGS D.C. RESISTANCE	RATINGS INDUCTANCE (0 CURRENT 1000 ~)	REPLACEMENT DATA ESPEY PART No.	Halldorson PART No.	Merit PART No.	Stancor PART No.	Thordarson PART No.	Triad PART No.
L25	.160A	276Ω	10.2HY	B16.353					

MISCELLANEOUS

ITEM No.	PART NAME	ESPEY PART No.	NOTES
M1	Dial Light		#47
M2	Dial Light		#47
M3	Tuning Cap.	B6.070	6 Gang (AM Sections, 30-535MMF, 30-535MMF, 30-535MMF)
M4	Switch		Selector-(Rotary-Wafer Type)
A6	Trimmer Cap.	C13518	AM Osc. Padder



DIAL CORD STRINGING

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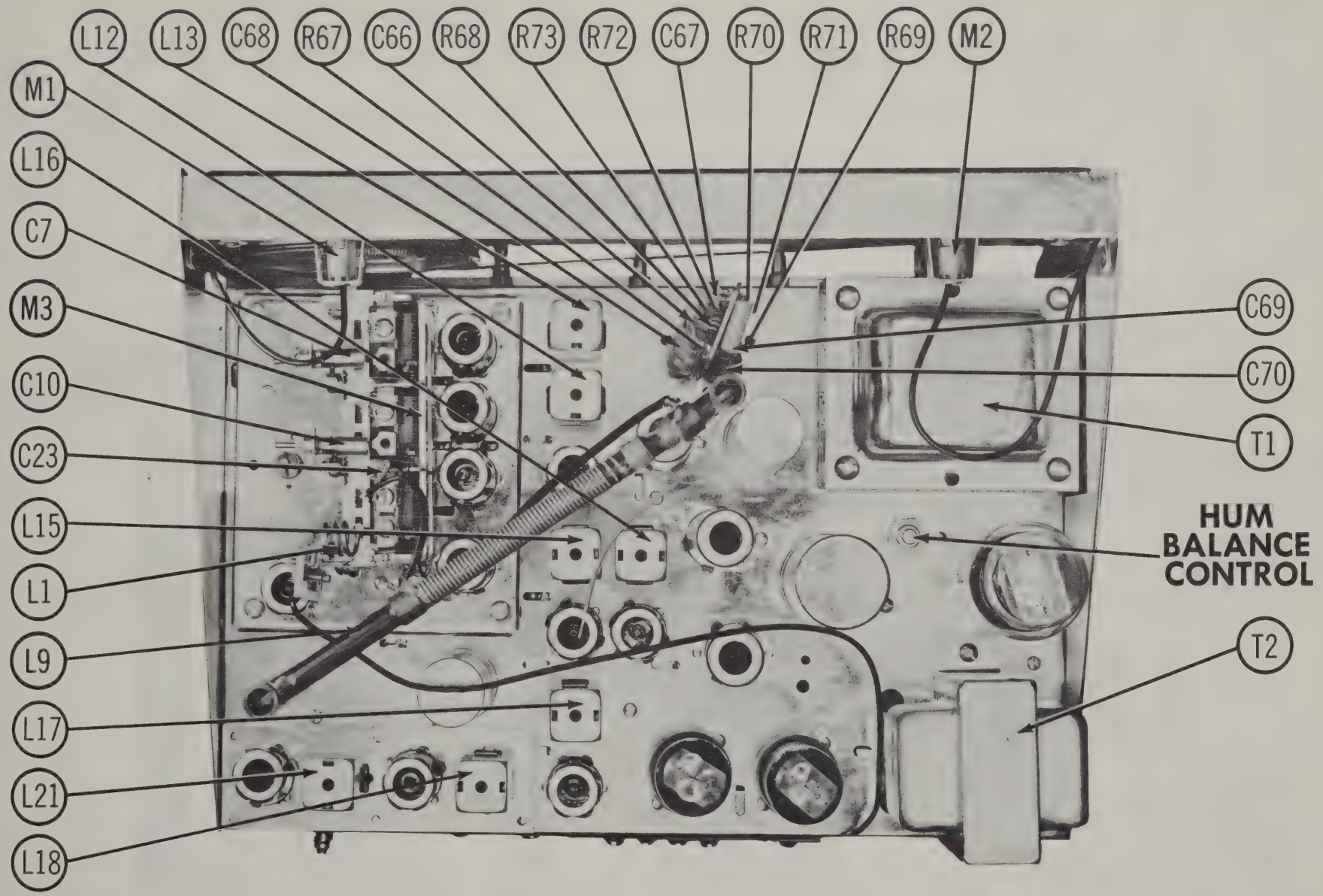

CHASSIS-TOP VIEW

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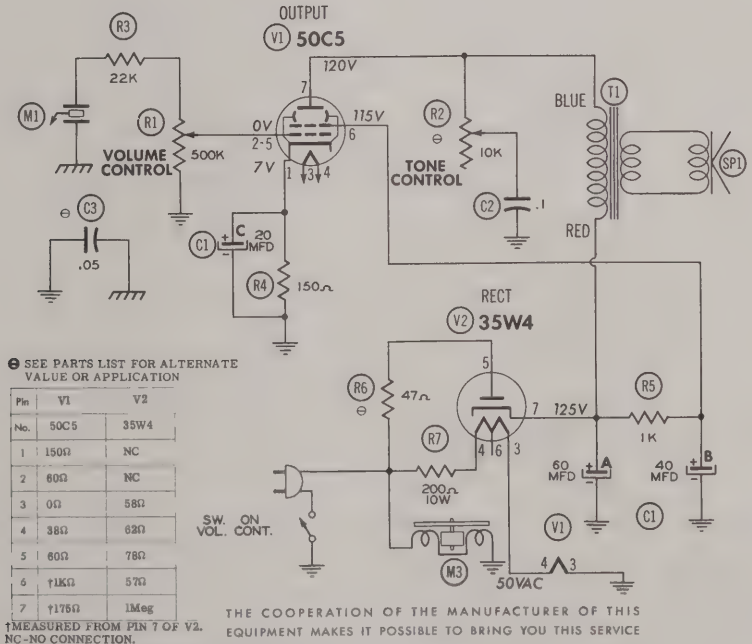
FIRESTONE
MODEL 4-A-130

TRADE NAME	Firestone Model 4-A-130 (Code No. 364-4-M36)
SUPPLIER	Firestone Tire & Rubber Co., 1200 Firestone Pkwy., Akron, Ohio
TYPE SET	AC Operated Phono Amplifier With 3 Speed Manual Record Player
TUBES (Two)	Types 50C5 Output, 35W4 Rectifier
POWER SUPPLY	105-125 Volts AC-60 Cycles RATING .41 Amp. @ 117 Volts AC



⊖ SEE PARTS LIST FOR ALTERNATE VALUE OR APPLICATION

Pin No.	V1 50C5	V2 35W4
1	150Ω	NC
2	60Ω	NC
3	0Ω	58Ω
4	38Ω	62Ω
5	60Ω	78Ω
6	†1KΩ	57Ω
7	†175Ω	1Meg

†MEASURED FROM PIN 7 OF V2.
NC-NO CONNECTION.

THE COOPERATION OF THE MANUFACTURER OF THIS EQUIPMENT MAKES IT POSSIBLE TO BRING YOU THIS SERVICE

A PHOTOFACT STANDARD NOTATION SCHEMATIC

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FIRESTONE
MODEL 4-A-130

HOWARD W. SAMS & CO., INC. • Indianapolis 5, Indiana

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PARTS LIST AND DESCRIPTIONS

TUBES (SYLVANIA, GENERAL ELECTRIC, WESTINGHOUSE)

ITEM No.	USE	REPLACEMENT DATA: FIRESTONE PART No.	REPLACEMENT DATA: STANDARD REPLACEMENT	RETMA BASE TYPE	NOTES
V1	Output	50C5	50C5	7CV	
V2	Rectifier	35W4	35W4	5BQ	

CAPACITORS

Capacity values given in the rating column are in mfd. for Electrolytic and Paper Capacitors, and in mmfd. for Mica and Ceramic Capacitors.

ITEM No.	RATING: CAP.	RATING: VOLT	REPLACEMENT DATA: FIRESTONE PART No.	CENTRALAB PART No.	ERIE PART No.	MALLORY PART No.	PYRAMID PART No.	SANGAMO PART No.	
C1A	60	150	1016			TCT3117	TDL-552	FMT-333	
B	40	150							
C	20	25							
C2	.1	200	804	DF-104		PT401	IMP2-P1	330201	
C3	.05	200		DF-503		PT415	IMP2-S5	330215	Note 1

Note 1. Some versions use .02MFD in this application (Part No. 801).

CONTROLS

ITEM No.	RATING: RESISTANCE	RATING: WATTS	REPLACEMENT DATA: FIRESTONE PART No.	IRC PART No.	CLAROSTAT PART No.	CENTRALAB PART No.	MALLORY PART No.	INSTALLATION NOTES
R1A	500KΩ	½	412	Q13-133	A47-500K-Z	AB-60	U-48	Volume
B	Shaft		Not Req.	Not Req.	KSS-3	AK-4	Not Req.	Attach to R1A
C	Switch		Not Req.	76-1	SWE-12	KB-1	US-26	Attach to R1A
R2A	10KΩ	½	408G	Q13-116	A47-10K-Z	AB-15	U-18	Tone - See note.
B	Shaft		Not Req.	Not Req.	KSS-3	AK-4	Not Req.	Attach to R2A

Note 1. Some versions may use an alternate control Part No. 403.

RESISTORS

ITEM No.	RATING: OHMS	RATING: WATT	REPLACEMENT DATA: FIRESTONE PART No.	IRC PART No.	NOTES
R3	22KΩ	½	517	BTS-22K	
R4	150Ω	½	505	BTS-150	
R5	1000Ω	½	537	BTS-1000	

ITEM No.	RATING: OHMS	RATING: WATT	REPLACEMENT DATA: FIRESTONE PART No.	IRC PART No.	NOTES
R6	47Ω	½	520	BTS-47	Note 1
R7	200Ω	10	623		

Note 1. Some versions use a 30Ω resistor in this application.

TRANSFORMER (AUDIO OUTPUT)

ITEM No.	IMPEDANCE: PRI.	IMPEDANCE: SEC.	REPLACEMENT DATA: FIRESTONE PART No.	Halldorson PART No.	Merit PART No.	Stancor PART No.	Thordarson PART No.	Triad PART No.	NOTES
T1	2.3KΩ	3.3Ω	1209	Z1101	A-3025	A-3332	26S58	S-12X	

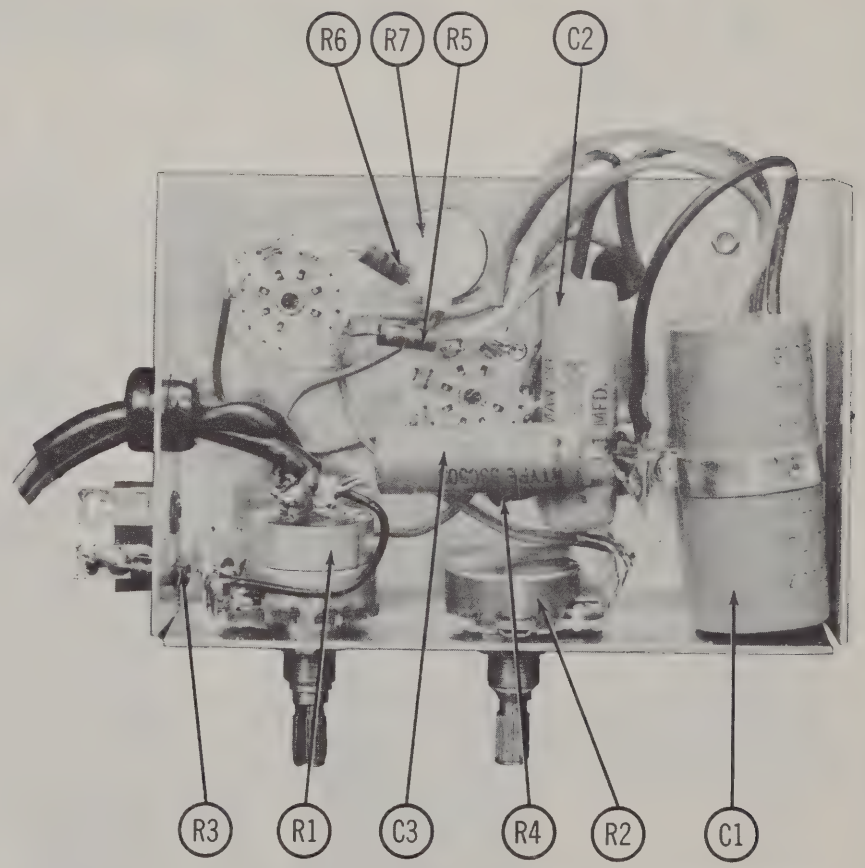
SPEAKER

ITEM No.	RATINGS: SIZE	RATINGS: FIELD	RATINGS: V. C. IMP.	REPLACEMENT DATA: FIRESTONE PART No.	QUAM PART No.	NOTES
SP1	4" x6"	PM	3.3Ω	2617-1	46A1	

PHONO CARTRIDGE

ITEM No.	REPLACEMENT DATA: FIRESTONE PART No.	ASTATIC PART No.: CARTRIDGE	ASTATIC PART No.: NEEDLE	ELECTRO-VOICE PART No.: CARTRIDGE	ELECTRO-VOICE PART No.: NEEDLE	REMARKS
M1	2565-A					

CHASSIS—BOTTOM VIEW



PARTS LIST AND DESCRIPTIONS (Continued)

PHONO NEEDLE

(FOR REPLACEMENT IN ORIGINAL EQUIPMENT CARTRIDGE)

ITEM No.	REPLACEMENT DATA: FIRESTONE PART No.	JENSEN PART No.	PERMO PART No.	WALCO PART No.	REMARKS
M2	2565-B (33 1/3 - 45RPM needle) 2565-C (78RPM needle)	*W-44LP and *W-44	*A-432 and *C-433	*W-26MGA or †W-26MGS and *W-26A or †W-26S	* Metal † Jewel

MISCELLANEOUS

ITEM No.	PART NAME	FIRESTONE PART No.	NOTES
M3	Phono Motor	2580	3 Speed-Alternate Part # 2582.
	Case	2051	
	Knob		Control-2 Used

PHOTOFACT* Folder

GENERAL ELECTRIC MODELS 21C40, 21C130, 21C131, 21C151, 21C152, 21C156, 21C157 ("O" Line)

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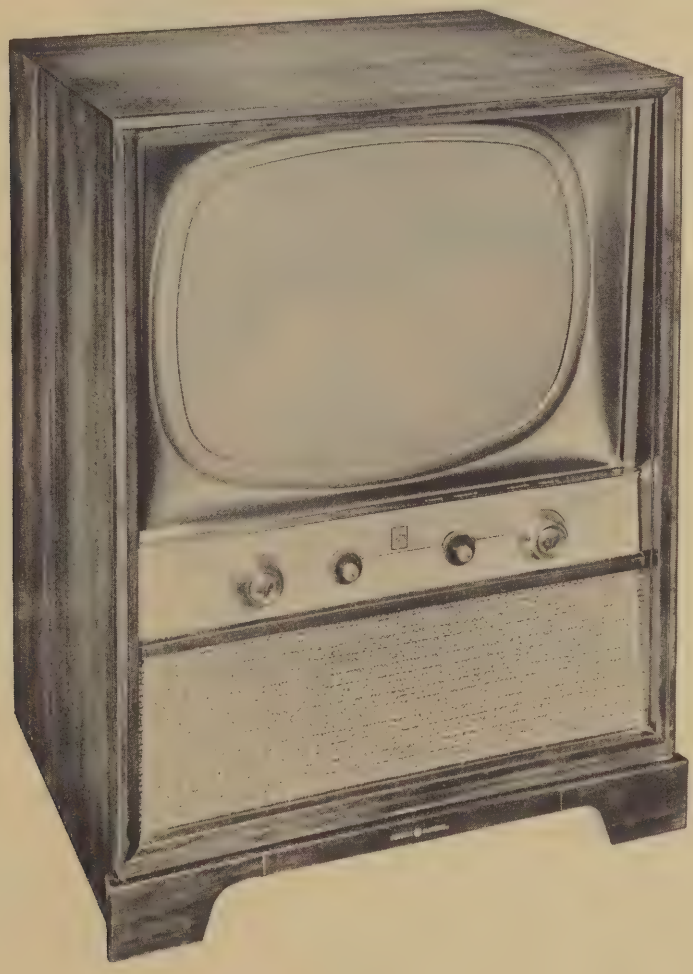

MODEL 21C130

GENERAL ELECTRIC MODELS 21C40, 21C130, 21C131, 21C151, 21C152, 21C156, 21C157 ("O" Line)

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GENERAL ELECTRIC MODELS 21C40, 21C130, 21C131, 21C151, 21C152, 21C156, 21C157 ("O" Line)

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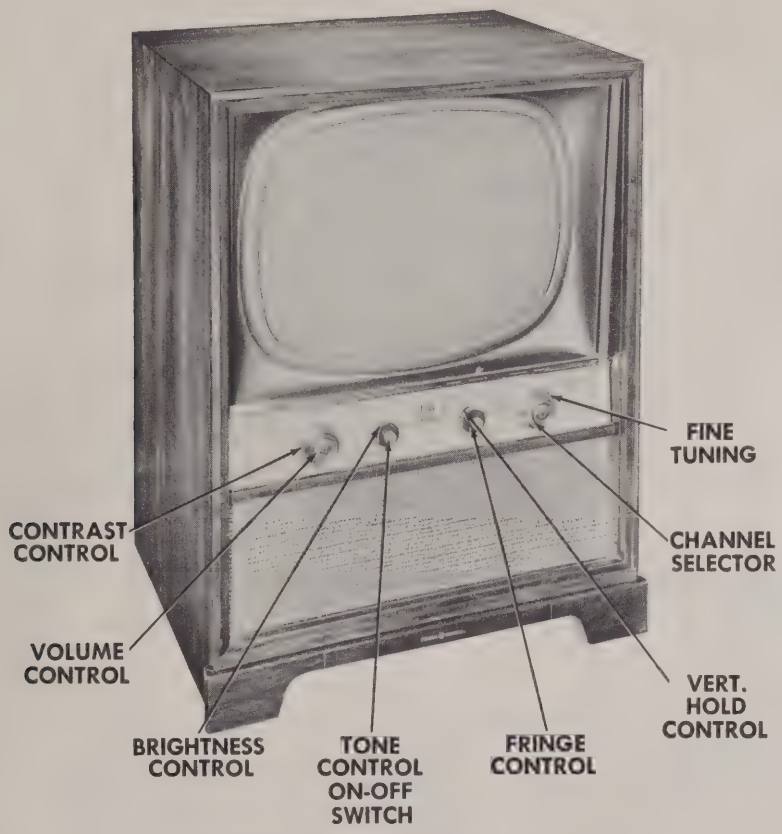

GENERAL ELECTRIC MODEL 21C130

TRADE NAME	General Electric Models 21C40, 21C130, 21C131, 21C151, 21C152, 21C156, 21C157 ("O" Line)
MANUFACTURER	General Electric Co., Electronics Dept., Electronics Park, Syracuse, N.Y.
TYPE SET	Television Receiver
TUBES	Nineteen
POWER SUPPLY	110-120 Volts AC-60 Cycle RATING 1.74 Amp. @ 117 Volts AC
TUNING RANGE	Channels 2 thru 13 VHF, 14 thru 83 UHF, Video IF 45.75MC, Sound IF 41.25MC (Intercarrier)

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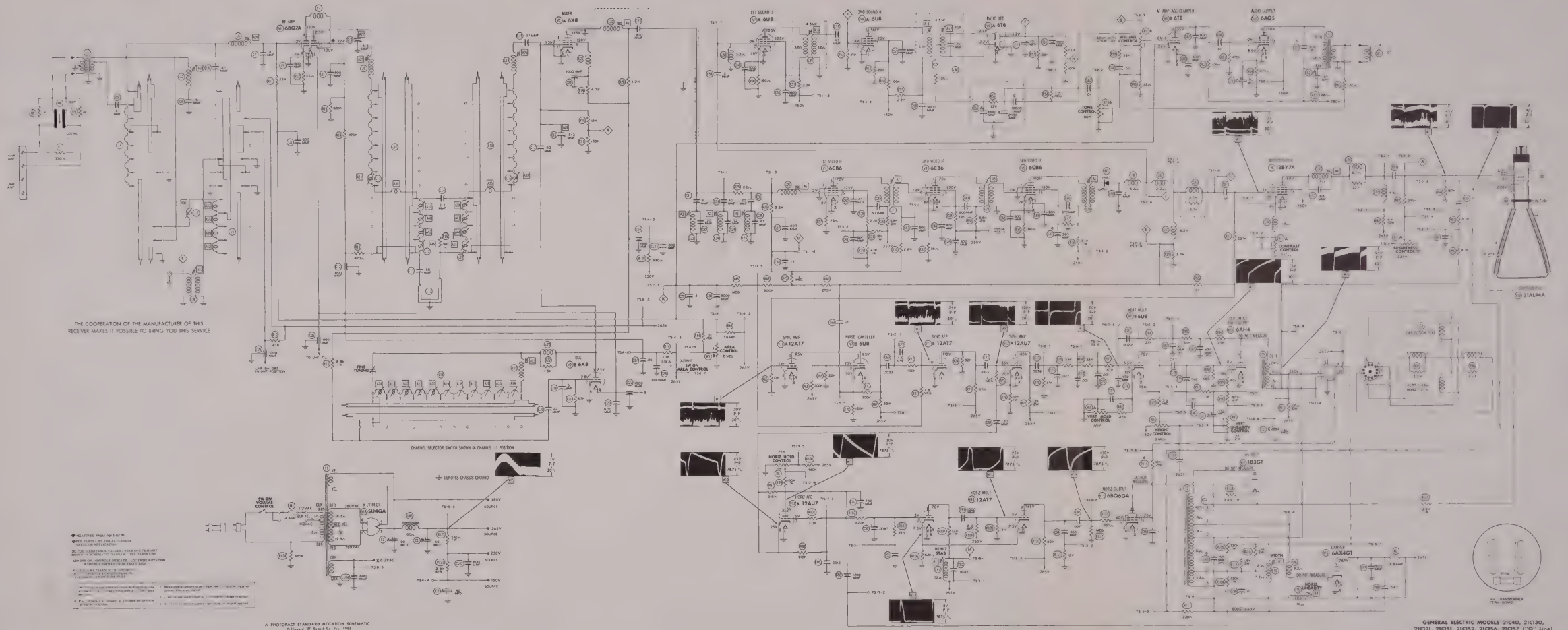

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CHASSIS-TOP VIEW

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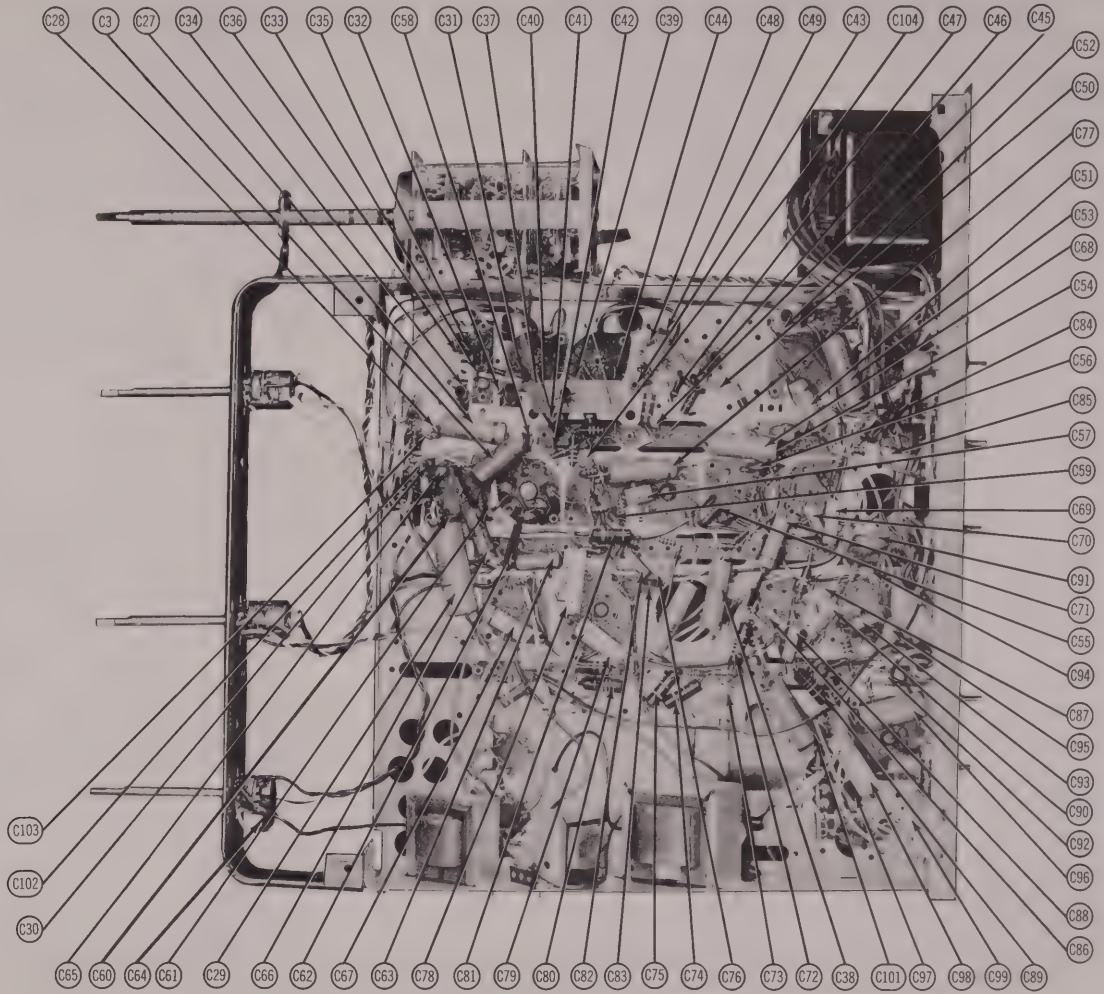

CHASSIS BOTTOM VIEW-CAPACITOR IDENTIFICATION

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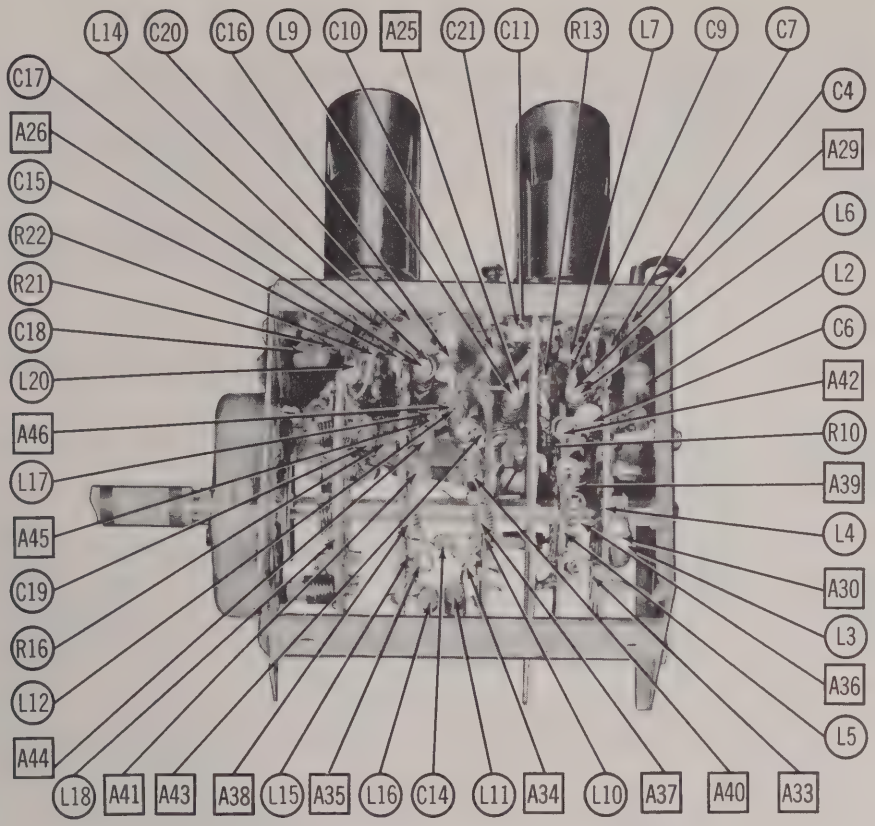
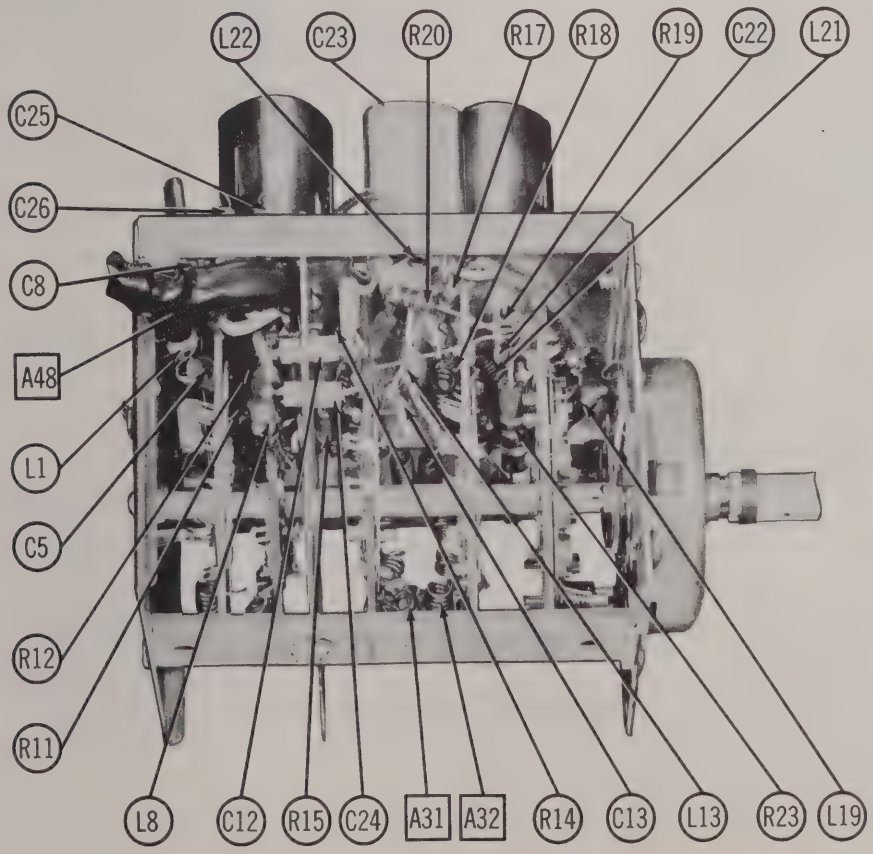


RF TUNER-RIGHT SIDE



RF TUNER-LEFT SIDE

PAUL H. ...
L. F. BLANKENSHIP
3924 ME...
DENVER, COLORADO

ALIGNMENT INSTRUCTIONS

ALIGNMENT INSTRUCTIONS--READ CAREFULLY BEFORE ATTEMPTING ALIGNMENT

The high voltage shock hazard may be eliminated by removing the horizontal output tube 6BQ6 (V10) from its socket. Do not remove the horizontal multivibrator tube (V14) to disable the high voltage. Allow a 30 minute warm-up period for receiver and test equipment.

TRAP ALIGNMENT

Turn the volume control maximum counter clockwise. Turn the contrast control maximum clockwise. Connect a 100KΩ resistor from pin 8 of VTD (6U8) to B+.

	DUMMY ANTENNA	SWEEP GENERATOR COUPLING	SWEEP GENERATOR FREQUENCY	MARKER GENERATOR FREQUENCY	CHANNEL	CONNECT SCOPE	ADJUST	REMARKS
1.	.001MFD	High side to point ⑰. Low side to chassis.	Not used	47.25MC (400^Mod)	11, 12 or 13	Vert. Amp. to point ⑯. Low side to chassis.	A1	Adjust for MINIMUM 400^ indication on scope. If necessary use maximum scope gain.
2.	"	"	"	41.25MC	"	"	A2	"
3.	"	"	"	36.0MC	"	"	A3	"
4.	"	High side to point ⑭. Low side to chassis.	"	4.5MC (400^Mod)	"	Vert. Amp. thru detector (Fig. I) to point ⑯. Low side to chassis.	A4	Adjust for MINIMUM 400^ indication on scope. Remove 100KΩ from pin 8 of VTB and B+.

VIDEO IF ALIGNMENT

Turn the contrast control to minimum contrast position. If during adjustment two peaks occur, the correct peak may be obtained by turning the slug fully counter clockwise, then clockwise until the first peak appears again.
Connect the negative lead of a 4.5 volt bias supply to point ⑰. Connect the positive lead to chassis.
The channel selector switch should be set to channel 11, 12 or 13. Select the channel (11, 12 or 13) on which the response curve does not change shape when turning the fine tuning control.
Calibrate the scope so that 5.0 volts peak to peak produces two inches of vertical deflection.
Turn area switch A control maximum counter clockwise.
Connect the synchronized sweep voltage from the sweep generator to the horizontal input of the oscilloscope for horizontal deflection.

	DUMMY ANTENNA	SWEEP GENERATOR COUPLING	SWEEP GENERATOR FREQUENCY	MARKER GENERATOR FREQUENCY	CHANNEL	CONNECT SCOPE	ADJUST	REMARKS
5.	.001MFD	High side to point ⑰. Low side to chassis.	44MC (50MC Swp)	44.1MC	11, 12 or 13	Vert. Amp. thru 10KΩ to point ⑯. Low side to chassis.	A5, A6	Adjust for maximum response on scope.
6.	"	"	"	44.8MC	"	"	A7	"
7.	"	"	"	43.9MC	"	"	A8	"
8.	"	"	"	45.75MC	"	"	A6, A9	Adjust to shape peak region of response curve (Fig. 2) with proper placement of the 45.75MC marker.
9.	"	"	"	38.0MC 41.25MC 42.5MC 45 0MC 45 75MC 47.25MC	"	"		Make final adjustments for response curve similar to Fig. 2. If necessary, SLIGHTLY retouch A5 thru A9 for desired response. Adjust A5 for response of curve. Adjust A7 to place 45.75MC marker at 40% on response curve. Adjust A8 to place 42.5MC marker at 70% on response curve. Increase sweep generator output and check 38.0MC, 41.25MC and 47.25MC trap positions on response curve. If necessary, SLIGHTLY retouch A1, A2 and A3 for proper trap positions. If trap adjustments are retouched, recheck 42.5MC and 45.75 MC markers on response curve.

SOUND IF ALIGNMENT USING AM SIGNAL GENERATOR AND VTVM

Connect two matched 100KΩ (±1%) resistors in series from point ⑰ to chassis. The junction of these two resistors is alignment point ⑱ as shown on the schematic.

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	CHANNEL	CONNECT VTVM	ADJUST	REMARKS
10.	Direct	High side to point ⑰. Low side to chassis.	4.5MC (Unmod)	Any	DC probe to point ⑰. Common to chassis.	A10	Remove V8 from its socket. Adjust for maximum deflection on VTVM.
11.	"	"	"	"	DC probe to point ⑰. Common to chassis.	A-11	Adjust for maximum deflection. Retouch A10 for maximum deflection.
12.	"	"	"	"	DC probe to point ⑱. Common to point ⑰.	A12	Adjust for zero reading. A positive and negative reading will be obtained on either side of the correct setting. Replace V8 in its socket. Tune in a clear TV station. Check audio buzz. If present, readjust A12 SLIGHTLY for MINIMUM buzz and clearest sound.

SOUND IF ALIGNMENT USING FM SIGNAL GENERATOR AND OSCILLOSCOPE

Use frequency modulated signal with 80^ modulation and 450KC sweep. Use 120^ sawtooth voltage in scope for horizontal deflection.

	DUMMY ANTENNA	SWEEP GENERATOR COUPLING	SWEEP GENERATOR FREQUENCY	MARKER GENERATOR FREQUENCY	CHANNEL	CONNECT SCOPE	ADJUST	REMARKS
10.	Direct	High side to point ⑰. Low side to chassis.	4.5MC (450KC Swp)	4.5MC	Any	Vert. Amp. to point ⑯. Low side to chassis.	A10	Remove V8 from its socket. Adjust for maximum amplitude and symmetry similar to Fig. 3.
11.	"	"	"	"	"	Vert. Amp. to point ⑯. Low side to chassis.	A-11	Disconnect stabilizing capacitor C3. Adjust A-11 for curve of maximum amplitude and symmetry similar to Fig. 3. Retouch A10 for maximum.
12.	"	"	"	"	"	Vert. Amp. to point ⑯. Low side to chassis.	A12	Reconnect stabilizing capacitor C3. Adjust so that 4.5MC occurs at center of crossover lines as in Fig. 4. SLIGHTLY retouch A-11 for maximum amplitude and symmetry of crossover lines. Replace V8 in its socket.

SOUND IF ALIGNMENT USING TV SIGNAL AND VTVM

Follow steps 10, 11 and 12 using station audio instead of 4.5MC signal generator frequency as under "Sound IF Alignment Using AM Signal Generator and VTVM."

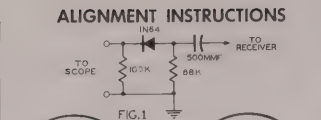


FIG. 1

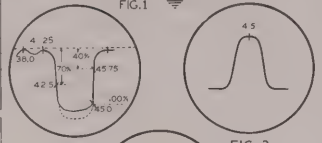


FIG. 2

FIG. 3

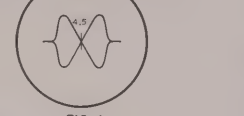
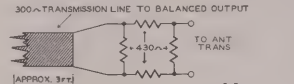
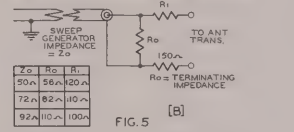


FIG. 4





Zo	Ro	R1
50^	56^	120^
72^	82^	110^
92^	110^	100^

FIG. 5

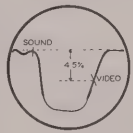


FIG 6

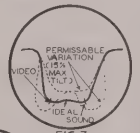


FIG. 7

FIG 8

VHF OSCILLATOR ALIGNMENT

Remove 300Ω transmission line from the input to antenna coil (L1). Connect the negative lead of a 3 volt bias supply to point ⑰. Connect positive lead to chassis.
Set the fine tuning control two-thirds turn from its fully counter clockwise position and leave it in this position during entire oscillator alignment.
Connect the synchronized sweep voltage from the sweep generator to the horizontal input of the oscilloscope for horizontal deflection.
The sweep generator output lead should be terminated with its characteristic impedance, usually 90 ohms.

	DUMMY ANTENNA	SWEEP GENERATOR COUPLING	SWEEP GENERATOR FREQUENCY	MARKER GENERATOR FREQUENCY	CHANNEL	CONNECT SCOPE	ADJUST	REMARKS
13.	Fig. 5	Thru dummy (Fig. 5) across primary of antenna input coil (L1).	213MC (10MC Swp)	211.25MC 215.75MC	13	Vert. Amp. to point ⑯. Low side to chassis.	A13	Adjust so that video marker falls at 45% on response curve as in Fig. 6. Sound markers should fall in trap notch.
			207MC (10MC Swp)	205.25MC 209.75MC	12		A14	
			201MC (10MC Swp)	199.25MC 203.75MC	11		A15	
			195MC (10MC Swp)	193.25MC 197.75MC	10		A16	
			189MC (10MC Swp)	187.25MC 191.75MC	9		A17	
			183MC (10MC Swp)	181.25MC 185.75MC	8		A18	
			177MC (10MC Swp)	175.25MC 179.75MC	7		A19	
			85MC (10MC Swp)	83.25MC 87.75MC	6		A20	
			79MC (10MC Swp)	77.25MC 81.75MC	5		A21	
			85MC (10MC Swp)	187.25MC 71.75MC	4		A22	
			65MC (10MC Swp)	61.25MC 65.75MC	3		A23	
			57MC (10MC Swp)	55.25MC 59.75MC	2		A24	

VHF RF AND MIXER ALIGNMENT

Remove the 300Ω transmission line from the input to antenna coil (L1).
Connect the negative lead of a 3 volt bias supply to point ⑰. Connect the positive lead to chassis.
Connect the synchronized sweep voltage from the sweep generator to the horizontal input of the oscilloscope for horizontal deflection.
The sweep generator output lead should be terminated with its characteristic impedance, usually 90 ohms.

	DUMMY ANTENNA	SWEEP GENERATOR COUPLING	SWEEP GENERATOR FREQUENCY	MARKER GENERATOR FREQUENCY	CHANNEL	CONNECT SCOPE	ADJUST	REMARKS
14.	Fig. 5	Thru dummy (Fig. 5) across primary of antenna input (L1).	213MC (15MC Swp)	211.25MC 215.75MC	13	Vert. Amp. thru 10KΩ to point ⑯. Low side to chassis.	A25, A26	Adjust for response of maximum amplitude and symmetry similar to Fig. 7. If this exceeds 15% it may be necessary to compress or expand coil turns of L21. Use insulated tool to prevent shorting B+.
15.	"	"	177MC (15MC Swp)	175.25MC 179.75MC	7	"	A27, A28, A29	Adjust for response curve similar to Fig. 7. A27 and A28 affect bandwidth. Adjust A29 for maximum gain and MINIMUM tilt. If necessary, reposition L21 and L26 (coils whose adjustments are A21 and A22) to obtain desired coupling.
16.	"	"	207MC (15MC Swp)	205.25MC 209.75MC	12	"		Check each channel for response similar to Fig. 7. If not within limits on any high band channel, make compromise adjustments of A23 thru A29 with channel switch set to that channel. Recheck all other high band channels to see that they have not been seriously affected.
			201MC (15MC Swp)	199.25MC 203.75MC	11			
			195MC (15MC Swp)	193.25MC 197.75MC	10			
			189MC (15MC Swp)	187.25MC 191.75MC	9			
			183MC (15MC Swp)	181.25MC 185.75MC	8			
17.	"	"	85MC (15MC Swp)	83.25MC 87.75MC	6	"	A30 A31 A32	Adjust for maximum amplitude flat topped response curve similar to Fig. 8.
18.	"	"	79MC (15MC Swp)	77.25MC 81.75MC	5	"	A33, A34, A35	Check for response similar to Fig. 8. If necessary, adjust by compressing or expanding coil turns to obtain response similar to Fig. 8.
19.	"	"	69MC (15MC Swp)	67.25MC 71.75MC	4	"	A36, A37, A38	"
20.	"	"	63MC (15MC Swp)	61.25MC 65.75MC	3	"	A39, A40, A41	"
21.	"	"	57MC (10MC Swp)	55.25MC 59.75MC	2	"	A42, A43, A44	"

UHF 40MC ALIGNMENT

Connect the negative lead of a 3 volt bias supply to the VHF tuner AGC terminal. Connect positive lead to tuner chassis.
Switch the channel selector to UHF position. Remove shield from L22 and disconnect IF output link from L22.
Connect the synchronized sweep voltage from the sweep generator to the horizontal input of the oscilloscope for horizontal deflection.
The sweep generator output lead should be terminated with its characteristic impedance, usually 50 ohms.

	DUMMY ANTENNA	SWEEP GENERATOR COUPLING	SWEEP GENERATOR FREQUENCY	MARKER GENERATOR FREQUENCY	CHANNEL	CONNECT SCOPE	ADJUST	REMARKS
22.	Fig. 10	High side thru network (Fig. 10) to point ⑰. Low side to chassis.	620MC (80MC Swp)	40.5MC 45.75MC	UHF Position (Any channel)	Vert. Amp. thru 10KΩ to point ⑯. Low side to chassis.	A45, A46, A47	Adjust for response similar to Fig. 8. Adjust A45 for maximum gain & correct position of 40.5MC marker. Adjust A46 for maximum gain and correct position of 45.75MC marker. Adjust A47 for maximum amplitude and MINIMUM tilt. Replace shield over L22 and reconnect Video IF Output link.

GENERAL ELECTRIC MODELS 21C40, 21C130, 21C131, 21C151, 21C152, 21C156, 21C157 ("Q" Line)

ALIGNMENT INSTRUCTIONS (cont)

VHF IF TRAP ALIGNMENT

The IF trap (A48) may be aligned by tuning in the station on which the interferance occurs and adjusting A48 for minimum interferance in the picture. Be careful not to adjust A48 so that it attenuates channel 2 response.
If the frequency of the interfering signal is known, the trap may be aligned as in step 23.
Connect the synchronized sweep voltage from the sweep generator to the horizontal input of the oscilloscope for horizontal deflection.
The sweep generator output lead should be terminated with its characteristic impedance, usually 50 ohms.

	DUMMY ANTENNA	SWEEP GENERATOR COUPLING	SWEEP GENERATOR FREQUENCY	MARKER GENERATOR FREQUENCY	CHANNEL	CONNECT SCOPE	ADJUST	REMARKS
23.	Fig. 5	Thru dummy (Fig. 5) across VHF antenna terminals.	44MC (10MC Swp)	Set to freq. of interfering signal. Normally adjusted at 43.5MC	2	Vert. Amp. thru 10KΩ to point (E). Low side to chassis.	A48	Connect bias as under "UHF 40MC Alignment". Adjust for MINIMUM marker amplitude. Remove bias and all test equipment. Replace V15 in its socket, if not already replaced.

UHF TUNER ALIGNMENT

Set A48 to 43.5MC to provide VHF marker (notch) on response curve. Refer to step 23 for 43.5MC alignment of A48. Connect the negative lead of a 3 volt bias supply to point (K). Connect the positive lead to chassis.
Switch the channel selector to UHF position.
Connect the synchronized sweep voltage from the sweep generator to the horizontal input of the oscilloscope for horizontal deflection.
The sweep generator output lead should be terminated with its characteristic impedance, usually 50 ohms.

	DUMMY ANTENNA	SWEEP GENERATOR COUPLING	SWEEP GENERATOR FREQUENCY	MARKER GENERATOR FREQUENCY	CHANNEL	CONNECT SCOPE	ADJUST	REMARKS
24.	Fig. 10	Across UHF antenna terminals thru network (Fig. 10).	460MC (20MC Swp)	460MC	Maximum Position	Vert. Amp. thru 10KΩ to point (B). Low side to chassis.	A49	Adjust until marker coincides with notch (caused by 43.5MC trap (A48) on response curve as in Fig. 11.
25.	"	"	910MC (20MC Swp)	910MC	Maximum Position	"	A50	Adjust A50 until 910MC marker coincides with notch on response curve (Fig. 11). Repeat steps 24 and 25 until markers coincide on both ends of the UHF band.
26.	"	"	530MC (20MC Swp)	530MC	See Remarks	"		Set UHF tuning dial until 530MC marker coincides with notch as in Fig. 11. Connect a short clip lead across points (N) and (O)
27.	"	"	"	"	See Remarks (Step 26)	Vert. Amp. thru 10KΩ to pin 6 (plate) of V7A (6U8). Low side to chassis.	A51, A52	Disconnect shielded cable from VHF tuner. Connect a 33Ω resistor from center of cable to shield. Connect input of first sound IF amplifier (V7A-Pin 2) across 33Ω resistor. Adjust A51 and A52 for maximum amplitude and MINIMUM tilt to provide symmetrical response similar to Fig. 7. Remove 33Ω resistor and reconnect cable to VHF tuner socket. Remove short from points (N) and (O).
28.	"	"	880MC (20MC Swp)	880MC	See Remarks	Vert. Amp. thru 10KΩ to point B. Low side to chassis.		Set UHF tuning dial until 880MC marker coincides with notch as in Fig. 11. Connect a short clip lead across points (N) and (O).
29.	"	"	"	"	See Remarks) (Step 28)	Vert. Amp. thru 10KΩ to pin 6 (plate) of V7A (6U8). Low side to chassis.	A53, A54	Disconnect shielded cable from VHF tuner. Connect a 33Ω resistor from center of cable to shield. Connect input of first sound IF amplifier (V7A-Pin 2) across 33Ω resistor. Adjust A53 and A54 for symmetrical response as in Fig. 11. Remove short from point (N) and (O). Disconnect 33Ω and reconnect shield cable to VHF tuner. If necessary repeat steps 24 thru 29 until symmetrical response similar to Fig. 11 is obtained.

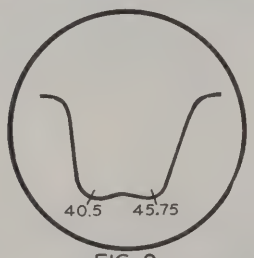


FIG. 9

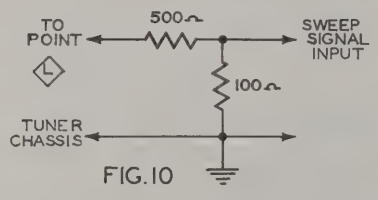


FIG. 10

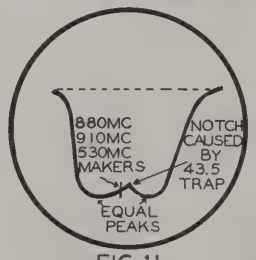
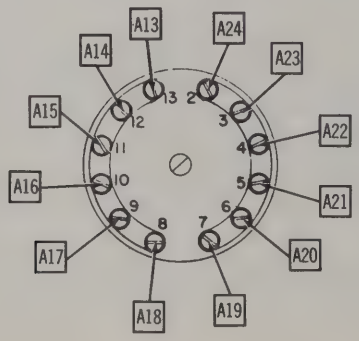
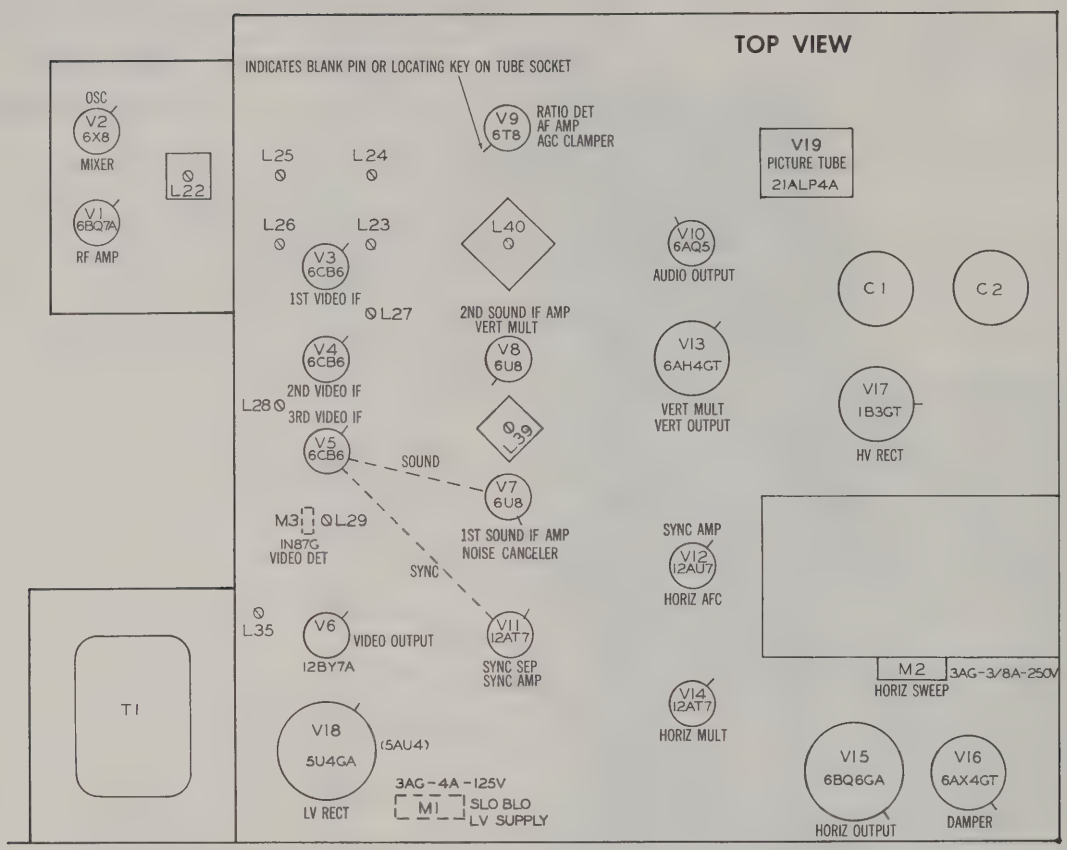


FIG. 11



TUBE PLACEMENT CHART



TUBE FAILURE CHECK CHART

The following chart lists tubes whose failures are most likely to produce the indicated symptoms. Refer to tube placement chart for location and type of tube.

POWER SUPPLY FAILURE
No raster, no sound - **V18, Fuse (M1)**

LOSS OF PICTURE OR SOUND
No pic, no sound, has raster - **V2, V3, V4, V5**
No pic, no sound, has snow - **V1, V2, V3**
No pic, has sound, has raster - **V6, V19**
Has pic, no sound - **V7, V8, V9, V10**
Overloaded picture - **V9**

SYNC FAILURE
No vert. sync - **V8, V12, V13**
No horiz. sync - **V12, V14**
No vert. or horiz. sync - **V11, V12**

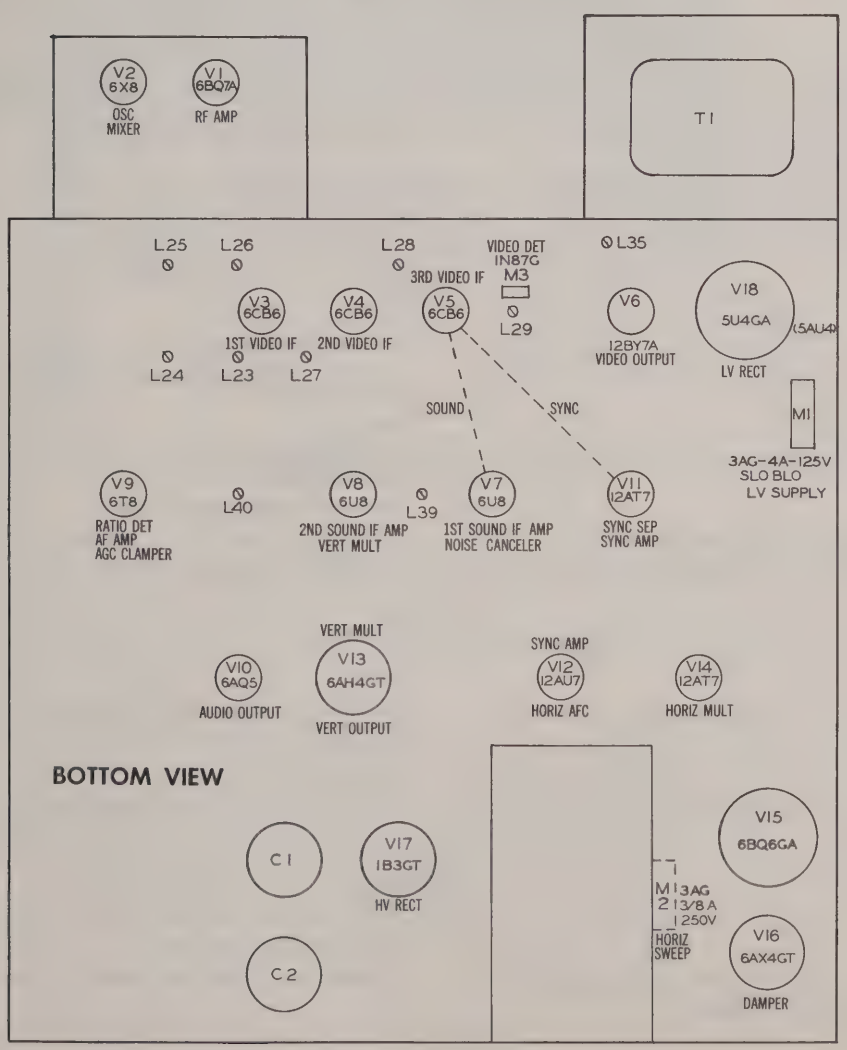
SWEEP FAILURE
No raster, has sound - **V14, V15, V16, V17, V19, Fuse (M2)**
No vertical deflection - **V8, V13**
Poor vert. linearity or foldover - **V8, V13**
Poor horiz. linearity or foldover - **V14, V15, V16**
Narrow picture - **V14, V15, V16, V17, V18**
Vert. off freq. - **V8, V12, V13**
Horiz. off freq. - **V12, V14**

PROPERTY OF
L. F. BLANKENSHIP
3024 MOADE ST.
DENVER, COLORADO

RESISTANCE MEASUREMENTS

Item	Tube	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8	Pin 9
V 1	6BQ7A	†3. 8KΩ	300KΩ	Inf.	. 1Ω	0Ω	Inf.	1. 3Meg	100Ω	0Ω
V 2	6X8	0Ω	4. 7KΩ	†11KΩ	. 1Ω	0Ω	0Ω	165KΩ	†8. 3KΩ	†4. 8KΩ
V 3	6CB6	1. 3Meg	56Ω	0Ω	. 1Ω	†7KΩ	†20KΩ	0Ω		
V 4	6CB6	1. 3Meg	56Ω	0Ω	. 1Ω	†7KΩ	†39KΩ	0Ω		
V 5	6CB6	. 1Ω	180Ω	0Ω	. 1Ω	†5. 5KΩ	†23KΩ	0Ω		
V 6	12BY7A	35Ω	230KΩ	0Ω	0Ω	0Ω	. 1Ω	†4KΩ	†3. 3KΩ	0Ω
V 7	6U8	†39KΩ	3. 2Ω	†5. 5KΩ	. 1Ω	0Ω	†5. 5KΩ	180Ω	90KΩ	22KΩ
V 8	6U8	▲6Meg	47KΩ	†35KΩ	. 1Ω	0Ω	†5. 5KΩ	0Ω	170KΩ	160KΩ
V 9	6T8	2Meg	22KΩ	2Meg	0Ω	. 1Ω	1. 3Meg	0Ω	250KΩ	†470KΩ
V 10	6AQ5	470KΩ	470Ω	. 1Ω	0Ω	†1. 8KΩ	†3. 3KΩ	470KΩ		
V 11	12AT7	†30KΩ	2. 5Meg	0Ω	0Ω	0Ω	†39KΩ	10KΩ	0Ω	. 1Ω
V 12	12AU7	†12KΩ	2. 2Meg	10KΩ	0Ω	0Ω	†170KΩ	2Meg	1Meg	. 1Ω
V 13	6AH4	2. 2Meg	0Ω	NC	TP	†700Ω	NC	. 1Ω	600Ω	
V 14	12AT7	†12KΩ	3Meg	820Ω	0Ω	0Ω	†82KΩ	13KΩ	820Ω	. 1Ω
V 15	6BQ6GA	NC	0Ω	NC	10KΩ	1Meg	NC	. 1Ω	0Ω	TOP CAP ▲26Ω
V 16	6AX4GT	NC	NC	2Meg	NC	†65Ω	NC	0Ω	. 1Ω	
V 17	1B3GT	PINS	1-8	HAVE	INF	RESISTANCE				TOP CAP ▲426Ω
V 18	5U4GA	NC	20KΩ	NC	20Ω	NC	18Ω	NC	20KΩ	
V 19	21ALP4A	0Ω	180KΩ	PIN 6 ▲220KΩ	PIN 10 ▲220KΩ	PIN 11 †300KΩ	PIN 12 . 1Ω			

†MEASURED FROM PIN 8 OF V18.
▲MEASURED FROM PIN 3 OF V16.
NC-NO CONNECTION.
TP-TIE POINT.



TUBE PLACEMENT CHART

SET 292 FOLDER 7

TROUBLE SHOOTING AIDS

SWEEP

HORIZONTAL

LOSS OF SWEEP

Follow procedure outlined under "Loss of High Voltage."

INSUFFICIENT SWEEP

Check by substitution V15, V16 and V18. Check adjustments B2 and B3. Check T2, T4A, C95, C94, R111, R114 and other associated components.

DRIVE LINES

Check by substitution V15 and V16. Check adjustment B3. Check T2, T4A, C94, C95, R111, R114, R110 and other associated components.

COMPRESSED LEFT SIDE

Check by substitution V15 and V16. Check horizontal output and damper stages for component failure or change of value.

FOLDS

Follow procedure outlined under "Drive Lines."

PIE CRUST EFFECT

Check by substitution V14, V15 and V16. Check C90 for open. Check L41, C91, C89, R107 and other associated components.

XMAS TREE EFFECT

Check by substitution V14, V15 and V16. Check T2 and T4 for internal arcing. Check R105, R104, C88, C87, C92, L41 and other associated components.

VERTICAL

LOSS OF SWEEP

Check by substitution V8 and V13. Check waveform W7.

If Satisfactory	If Unsatisfactory
Check T3, T4B, R91, R90, C2C and other associated components.	Check C78, C81, R83, R82, R5, and other associated components.

INSUFFICIENT SWEEP

Check by substitution V8 and V13. Check height and vertical linearity controls for proper operation. Check R83, T3 and other associated components.

COMPRESSED AT BOTTOM

Check by substitution V8 and V13. Check R83, R5, R117, C78 and other associated components.

COMPRESSED AT TOP

Check by substitution V8 and V13. Check R90, R89, R4, C2D, T3 and other associated components.

FOLDS

Check by substitution V8 and V13. Check C82, C83, C79, C80, R87, T3, T4B and other associated components.

SYNC

LOSS OF VERTICAL AND HORIZONTAL SYNC

Check by substitution V11, V12, and V7. Check C68, C69, C70, C71, R67, R71, R73, R76, R77 and other associated components.

LOSS OF VERTICAL SYNC-HORIZONTAL SYNC SATISFACTORY

Substitute V8. Check vertical integrator network. Check R82, R3A, R83, C72, C77 and other associated components.

LOSS OF HORIZONTAL SYNC-VERTICAL SYNC SATISFACTORY

Check by substitution V12 and V14. Check C86, C89, C90, R6, R99 and other associated components.

HORIZONTAL BENDING

Check by substitution V11, V12, V14 and V7. Check horizontal AFC network

VIDEO

LOSS OF VIDEO

Substitute V6. Check L34, L37, R42, C51, C53 and other associated components.

SOUND BARS (4.5MC BEAT)

Adjust tuner fine tuning for best sound and picture. Check adjustment A4. Check video IF alignment.

POOR CONTRAST

Substitute V6. Check contrast control. Check C51, C53, L33, L36, R42 and other associated components.

NEGATIVE PICTURE

Substitute V6. Check picture tube. Check C51, C53 and other associated components.

SMEAR

Substitute V6. Check L30, L31, L32, L33, L36, C51, C53 and other associated components.

WIDE BLACK BAR ACROSS PCITURE

Check by substitution V1, V3, V4, V5 and V6 for heater to cathode leakage.

AUDIO

WEAK OR NO SOUND

Check by substitution V7, V8, V9 and V10. Check stages V9 and V10 using audio signal generator. Apply audio signal across R1B.

If Satisfactory	If Unsatisfactory
Check ratio detector and audio IF stages for component failure or change of value.	Check C62, C65, C66, C67, C1C, R62, R64, R122, T7, speaker and other associated components.

BUZZ

Adjust tuner fine tuning for best sound and picture. Check adjustment A12 for minimum buzz. If still unsatisfactory, check audio IF alignment.

DISTORTED

Follow procedure outlined under "Weak or no Sound."

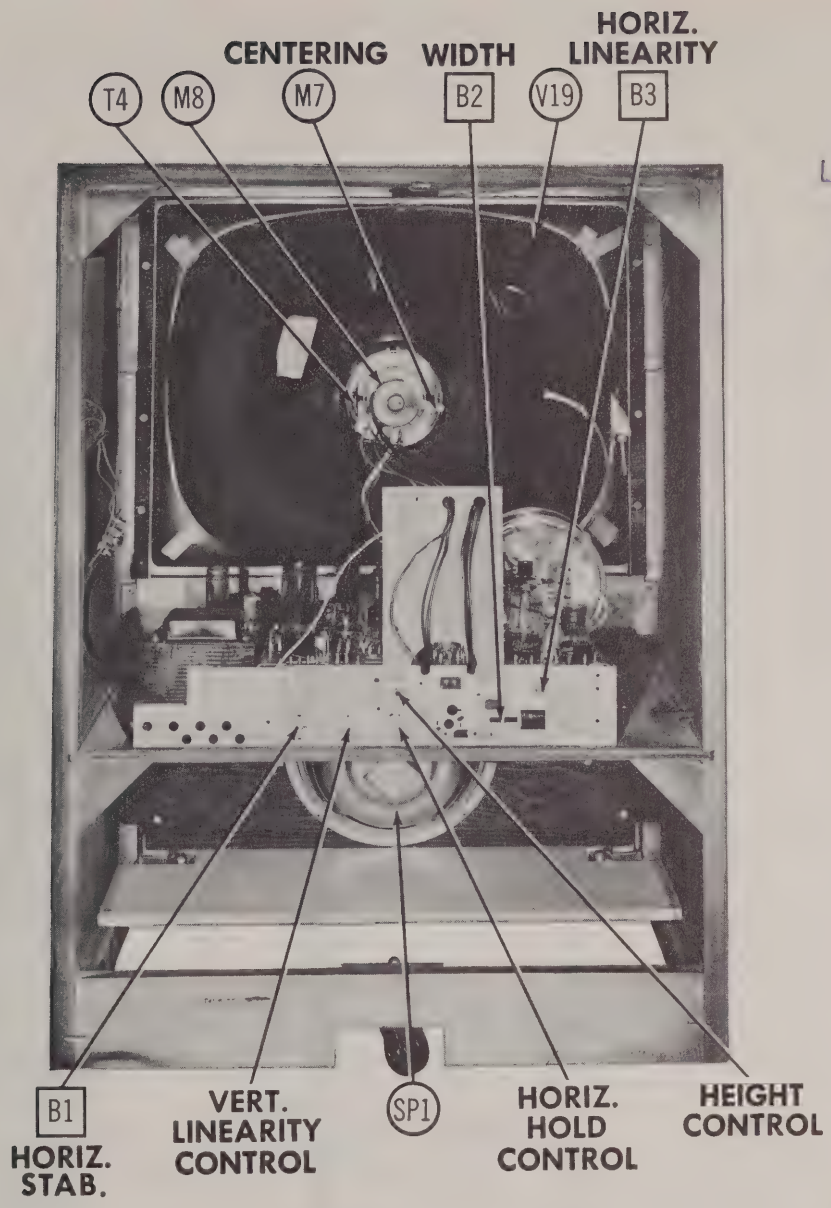
POWER

DEAD SET

If filaments fail to light, check fuse M1. Check AC interlock assembly. Check switch on tone control and T1. If filaments light, substitute V18. Check B+ filter and decoupling network.

SMALL AND/ON DIM PICTURE

Substitute V18. Check B+ filter and decoupling network.



CABINET—REAR VIEW

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L. F. BLANKENSHIP
3924 MEADE ST.
DENVER, COLORADO

HORIZONTAL SWEEP CIRCUIT ADJUSTMENTS

The horizontal stabilizer coil (L41) has been properly adjusted at the factory and should not require adjustment under normal conditions.

If adjustment should become necessary adjust as follows:

1. Tune in a TV station, preferably a test pattern.
2. Set the horizontal hold control until the picture locks in horizontal sync.
3. Connect the DC probe of a VTVM to point Ⓜ . Connect common lead to chassis. Adjust the horizontal stabilizer slug (B1) for a reading of a positive five volts at point Ⓜ .

Simultaneously adjust the horizontal width slug (B2) and the horizontal linearity slug (B3) for a picture that is slightly wider than necessary to fill the picture mask horizontally and is symmetrical from left to right.

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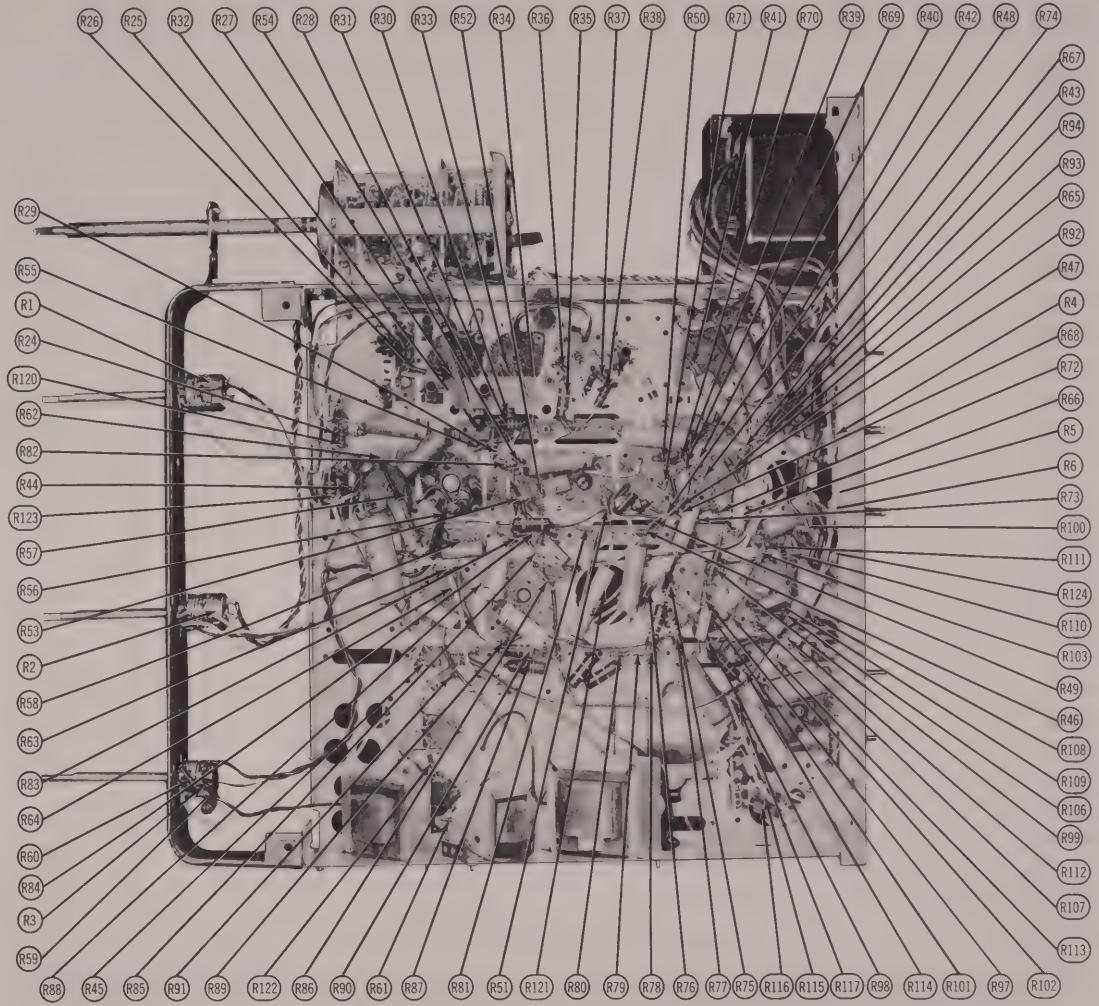

CHASSIS BOTTOM VIEW-RESISTOR IDENTIFICATION

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PARTS LIST AND DESCRIPTIONS

TUBES (SYLVANIA, GENERAL ELECTRIC, WESTINGHOUSE)

ITEM No.	USE	REPLACEMENT DATA: General Electric PART No.	REPLACEMENT DATA: STANDARD REPLACEMENT	RETMA BASE TYPE	NOTES
V1	RF Amp.	6BQ7A	6BQ7A	9AJ	
V2	Mixer-Osc.	6X8	6X8	9AK	
V3	1st Video IF Amp.	6CB6	6CB6	7CM	
V4	2nd Video IF Amp.	6CB6	6CB6	7CM	
V5	3rd Video IF Amp.	6CB6	6CB6	7CM	
V6	Video Output	12BY7A	12BY7A	9BF	
V7	1st Sound IF Amp. - Noise Canceler	6U8	6U8	9AE	
V8	2nd Sound IF Amp. - Vert. Mult.	6U8	6U8	9AE	
V9	Ratio Det. - AF Amp. - AGC Clamper	6T8	6T8	9E	
V10	Audio Output	6AQ5	6AQ5	7BZ	
V11	Sync Sep. - Sync Amp.	12AT7	12AT7	9A	
V12	Sync Amp. - Horiz. AFC	12AU7	12AU7	9A	
V13	Vert. Mult. - Vert. Output	6AH4	6AH4	8EL	
V14	Horiz. Mult.	12AT7	12AT7	9A	
V15	Horiz. Output	6BQ6GA	6BQ6GA	6AM	
V16	Damper	6AX4GT	6AX4GT	4CG	
V17	HV Rect.	1B3GT	1B3GT	3C	
V18	LV Rect.	5U4GA	5U4GA	5T	5AU4 used in UHF Models.

CATHODE-RAY TUBE

ITEM No.	REPLACEMENT DATA: General Electric PART No.	CBS PART No.	GENERAL ELECTRIC PART No.	SYLVANIA PART No.	WESTINGHOUSE PART No.	RETMA BASE TYPE	NOTES
V19	21ALP4A	21ALP4A ① 21ALP4	21ALP4A ① 21ALP4	21ALP4A ② 21ALP4	21ALP4A ① 21ALP4	12L 12L	① Aluminized ② Silver Screen

CAPACITORS

Capacity values given in the rating column are in mfd. for Electrolytic and Paper Capacitors, and in mmfd. for Mica and Ceramic Capacitors.

ITEM No.	RATING: CAP.	RATING: VOLT	REPLACEMENT DATA: General Electric PART No.	CENTRALAB PART No.	ERIE PART No.	MALLORY PART No.	PYRAMID PART No.	SANGAMO PART No.	NOTES
C1A	▬90	350	N-RCE-210			FP247	TM-3135	Q-221.5	
B	■40	350				TC29			
C	▲50	25							
C2A	▬30	350	N-RCE-211				TM-4131	Q-415	
B	▲40	300						MT-3516	
C	■30	350							
D	100	75							
C3	10	25	RCE-192			TC22	TD-10-25	FM-0210	
C4	5			TCZ-4R7	NP0A-050	ZT-555			
C5	6								
C6	47			DD-470	831-470	UC-5447			
C7	8								
C8	800			DD-801	831-801	DC-521			
C9	800			DD-801	831-801	DC-521			
C10	.5-3			829-3	3115-01-0R5	CT565A			
C11	800			DD-801	831-801	DC-521			
C12	1000								
C13	150			DD-151	811-151	UC-5315			
C14	2.2			TCZ-2R2	NP0A-2R2				
C15	47			DD-470	831-470	UC-5447			
C16	.5-3			829-3	3115-01-0R5	CT565A			
C17	.82								
C18	5								
C19	22			D6-220	GP1K-220	UC-5422			
C20	800			DD-801	831-801	DC-521			
C21	1000								
C22	1000								
C23	800			DD-801	831-801	DC-521			
C24	1000								
C25	1000								
C26	1000								
C27	.05	600	UCC-045	DF-503		PT615	IMP6-S5	330615	
C28	800		RCW-3037	DD-801	831-801	DC-521		K-1380	
C29	.5	200	RCC-016			PT405	IMP2-P5	330205	
C30	5000		RCW-3014	DD-502	811-005	DC-525		C-1250	
C31	91		N-RCG-002	TCZ-91	NP0-337-910			KR-1491	
C32	120		N-RCG-003	TCZ-120	NP0-333-121			KR-1312	
C33	10			TCZ-10	NP0K-100	ZT-541		KR-1410	
C34	33			TCZ-33	NP0L-330	ZT-5433		KR-1433	
C35	20		RCW-3080	TCZ-20	NP0K-200	ZT-542		KR-1420	
C36	47			TCZ-47	NP0-338-470	ZT-5447		KR-1447	
C37	800		RCW-3037	DD-801	831-801	DC-521		K-1380	
C38	.15	200	RCC-131			PT4015	IMP2-P15	3302015	
C39	800		RCW-3037	DD-801	831-801	DC-521		K-1380	
C40	470		RCW-3097	D6-471	GP2K-471	UC-5347		K-1347	
C41	800		RCW-3037	DD-801	831-801	DC-521		K-1380	
C42	800		RCW-3037	DD-801	831-801	DC-521		K-1380	
C43	800		RCW-3037	DD-801	831-801	DC-521		K-1380	
C44	470		RCW-3097	D6-471	GP2K-471	UC-5347		K-1347	
C45	800		RCW-3037	DD-801	831-801	DC-521		K-1380	
C46	800		RCW-3037	DD-801	831-801	DC-521		K-1380	
C47	360				GP2K-361			K-1336	Note 1
C48	800		RCW-3037	DD-801	831-801	DC-521		K-1380	
C49	800		RCW-3037	DD-801	831-801	DC-521		K-1380	
C50	5		RCW-3113	TCZ-4R7	NP0A-4R7	ZT-555		KR-1550	
C51	.05	200	RCC-105	DF-503		PT415	IMP2-S5	330215	
C52	68	500	N-RCW-3190	TCZ-68	NP0-337-680			KR-1468	
C53	.1	600	RCC-046	DF-104		PT601	IMP6-P1	330601	
C54	5		RCW-3151	TCZ-4R7	NP0A-4R7	ZT-555		KR-1550	
C55	1800		RCW-3107	D6-182	GP2-333-182	UC-5218		C-1218	
C56	5000		RCW-3014	DD-502	811-005	DC-525		C-1250	
C57	47	500	RCU-320	D6-470	GP1K-470	MC225		K-1447	
C58	5000		RCW-3014	DD-502	811-005	DC-525		C-1250	
C59	5000		RCW-3014	DD-502	811-005	DC-525		C-1250	

PROPERTY OF
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3924 MEADE ST.
DENVER, COLORADO

CAPACITORS (cont)

ITEM No.	RATING CAP.	RATING VOLT	REPLACEMENT DATA General Electric PART No	CENTRALAB PART No	ERIE PART No	MALLORY PART No	PYRAMID PART No	SANGAMO PART No	NOTES
C80	5000		RCW-3016	DD-502	811-006	DC-525		C-1350	
C81	5000		RCW-3016	DD-502	811-006	DC-525		C-1350	
C82A	1000			DD-102	801-001	DC-531	IMPE-D1	K-1310	
B	2000		†N-RRK-007	DD-202	801-003	DC-532	IMPE-D5	C-1330	
C	10000			DD-103	811-01	DC-511	IMPE-S1	330611	
C83	.01	200	UCC-006	D6-103	GP2-333-103	PT611	IMPE-S1	330611	
C84	.015	300	RCC-136	DD68-153		PT6115	IMPE-S15	3306115	
C85	800		RCW-3037	DD-801	831-801	DC-521		K-1380	
C86	.01	600	UCC-49	DD-103	GP2-333-103	PT611	IMPE-S1	330611	
C87	.0047	1000		DD-472		PT6147	2U6.005	330647	Note 2
C88	.15	300	RCC-131			PT6015	IMPE-P15	3302015	
C89	.0033	600	RCN-066	D6-332	GP2-333-332	PT6233	IMPE-D33	3306233	
C70	470	600	RCU-230	D6-471	GP2K-471	MC3465		K-1347	
C71	.005	600	UCC-039	D6-502	GP2-333-502	PT6S5	IMPE-D5	330655	
C73	.0039	600	RCN-064			MC3963		CM-1339	
C72	.033	600		DF-303	817-03	PT6333	IMPE-S33	3306133	
C74	.001	400	RCC-119	D6-102	GP2L-102	PT611	IMPE-D1	330621	
C75	.001	400	RCC-118	D6-102	GP2L-102	PT621	IMPE-D1	330621	
C76	470	500		D6-471	GP2K-471	MC3465		K-1347	
C77	.1	200	UCC-013	DF-104		PT401	IMPE-P1	330301	
C78	.047	600	RCN-041						
C79	.022	600							
C80	.015	200	RCN-042						
C81	.0022	600	RCN-069	D6-222	GP2-333-222	PT6223	IMPE-D22	3306222	
C82	470	1000	N-RCU-343						
C83	470	1000	N-RCU-343						
C84	.01	600	RCN-035	D6-103	GP2-333-103	PT611	IMPE-S1	330611	
C85	.01	600	RCN-063	D6-103	GP2-333-103	PT611	IMPE-S1	330611	
C86	130	500	N-RCU-342	D6-121	GP2K-121	UC-3912		K-1312	
C87	750	500	RCU-340					CR-1313	
C88	1200	500	N-RCU-344					CR-1312	
C89	.0022	600	RCC-115						
C90	.0047	600	RCN-015	D6-472	GP2-333-472	PT6247	IMPE-D47	3306247	
C91	.1	300	UCC-013	DF-104		PT401	IMPE-P1	330301	
C92	.0047	600	RCN-063			MC3465		CR-1347	
C93	1000	500	RCU-338			MC3255		KR-1310	
C94	680		RCW-3065	D6-681	GP2K-681	UC-3369		K-1358	
C95	.0047	600	RCN-063	D6-472	GP2-333-472	PT6247	IMPE-D47	3306247	
C96	.1	600	RCC-068	DF-104		PT601	IMPE-P1	330601	
C97	5000		RCW-3016	DD-502	811-006	DC-525	IMPE-D5	C-1350	
C98	.047	600	RCN-041	DF-503		PT6147	IMPE-S47	3306147	
C99	.01	600	RCN-025	D6-103	GP2-333-103	PT611	IMPE-S1	330611	
C100	150	3000		DD90-151	3KV-151			K-1315	Note 3
C101	.1	600	RCC-066	DF-104		PT601	IMPE-P1	330601	
C102	800		RCW-3037	DD-801	831-801	DC-521		K-1380	
C103	800		RCW-3037	DD-801	831-801	DC-521		K-1380	
C104	800		RCW-3037	DD-801	831-801	DC-521		K-1380	

Note 1. Some versions use 3300MMF in this application (part # RCW-3163).
Note 2. Some versions use .0056MFD in this application.
Note 3. Some versions use 1600MMF in this application .
† Items C82A, C82B, C82C, R56 are combined in one unit.

CONTROLS

ITEM No	RATING RESISTANCE	RATING WATTS	REPLACEMENT DATA General Electric PART No.	IRC PART No.	CLAROSTAT PART No.	CENTRALAB PART No.	MALLORY PART No.	INSTALLATION NOTES
R1A	750Ω	½	N-RRC-316	QJ-7381	RTV-52	F1-3	UZ-31	Contrast (Panel)
B	500Ω	½			RS-66	RS-66	UR1283S	Volume (Rear) Tapped at 250KΩ
R2A	225KΩ	½	N-RRC-317	QJ-731	RTV-532	F1-3	UR1283S	Brightness (Panel)
B	100KΩ	½						Tone (Panel)
C	Switch							
R3A	150KΩ	½	N-RRC-318	QJ-720	RTV-530	FL-33	UR13566	Vertical Hold (Panel)
B	25Meg	½				RS-67		Area (Rear) Attach to R3A
C	Switch					KS-1		Area Attach to R3B
R4A	2000Ω	2	RRC-321	WK-3000	A43-2000-S		R2500-L	Vertical Linearity (Wire Wound)
B	Shaft		Not Req.	Not Req.	FK8-1/4		Not Req.	Attach to R4A
R5A	3Meg	½	RRC-301	QU-140	A47-2.5Meg-S	AB-84	5U-59	Height
B	Shaft		Not Req.	Not Req.	FK8-1/4	AK-1	Not Req.	Attach to R5A
R6A	25KΩ	½	N-RRC-315	QU-120	A47-25K-S	AB-38	TA25L	Horiz. Hold
B	Shaft		Not Req.	Not Req.	FK8-1/4	AK-1	Not Req.	Attach to R6A

▲CONCENTRIKIT EQUIVALENT: K-4 KIT, BASE ELEMENTS AND SHAFTS: B11-123, P1-223 (Panel)
B11-139, R2-316 (Rear)
T6-1 Switch

▲CONCENTRIKIT EQUIVALENT: K-4 KIT, BASE ELEMENTS AND SHAFTS: B11-128, P1-223 (Panel)
B13-128, R2-318 (Rear)
T6-1 Switch

▲CONCENTRIKIT EQUIVALENT: K-4 KIT, BASE ELEMENTS AND SHAFTS: B11-105, P1-224
B19-133X, R2-318

RESISTORS

ITEM No.	RATING OHMS	RATING WATT	REPLACEMENT DATA General Electric PART No.	IRC PART No.	NOTES
R7	330Ω	½		BTS-330	
R8	1000Ω	½	URD-049	BTS-1000	
R9	1000Ω	½	URD-047	BTS-1000	
R10	47KΩ	½	URD-089		
R11	22KΩ	½	URD-081		
R12	100Ω	½	URD-025	BTS-100	
R13	820KΩ	½	URD-119		
R14	470KΩ	½	URD-113		
R15	470Ω	½	URD-041	BTS-470	
R16	390Ω	½	URD-039		
R17	180KΩ	½	URD-091		
R18	15KΩ	½	URD-077		
R19	4700Ω	½	URD-065		
R20	1200Ω	½	URD-051		
R21	4700Ω	½	URD-065		
R22	1000Ω	½	URD-053		
R23	6800Ω	½	URE-089		
R24	3300Ω	½	URD-061	BTS-3300	
R25	22Ω	½	URD-009	BTS-22	
R26	2200Ω	½	URD-057	BTS-2200	
R27	56Ω	½	URD-019	BTS-56	
R28	2200Ω	½	URD-057	BTS-2200	
R29	47KΩ	½	URE-089	BTA-47K	
R30	6800Ω	2	URF-089		
R31	15KΩ	½	URE-079		
R32	2200Ω	½	URD-057	BTS-2200	
R33	56Ω	½	URD-019	BTS-56	
R34	39KΩ	½	URD-087		
R35	6800Ω	2	URF-089		
R36	180Ω	½	URD-031	BTS-180	
R37	18KΩ	½	URD-079		
R38	5.06KΩ 5%	1	URE-1065		
R39	3300Ω	½	URD-061		
R40	270KΩ	½	URD-107		
R41	220KΩ	½	URD-105		
R42	4000Ω	10	RRW-053	PW10-4000	

PARTS LIST AND DESCRIPTIONS (Continued)

RESISTORS (cont)

ITEM No.	RATING OHMS	RATING WATT	REPLACEMENT DATA General Electric PART No.	IRC PART No.	NOTES
R43	270KΩ	½	URD-107		
R44	10Meg	½	URD-145		
R45	3.9Meg	½	URD-135		
R46	1Meg	½	URD-121		
R47	1.8Meg	½	URD-127		
R48	300KΩ 5%	½	URD-1108		
R49	1Meg	½	URD-121		
R50	180Ω	½	URD-031	BTS-180	
R51	2200Ω	½	URD-057	BTS-2200	
R52	47KΩ	½		BTS-47K	
R53	33KΩ	½	URD-081	BTS-33K	
R54	100KΩ	½		BTS-100K	
R55	2200Ω	½	URD-057	BTS-2200	
R56	33KΩ	½	†N-RRE-007	BTS-33K	
R57	22KΩ	½	URD-081	BTS-33K	
R58	1.5Meg	½	URD-128	BTS-1.5Meg	
R59	1MEg	½		BTS-33K	
R60	22Ω	½	URD-009	BTS-22	
R61	180Ω	½	URD-027	BTS-180	
R62	470KΩ	½	URD-113	BTS-470K	
R63	470KΩ	½	URD-113	BTS-470K	
R64	470Ω	½	URD-041	BTS-470	
R65	10KΩ 5%	½	URD-073		
R66	10KΩ 5%	½	URD-073		
R67	39KΩ	½	URD-087		
R68	200KΩ 5%	½	URD-1104		
R69	33KΩ 5%	½	URD-1081		
R70	130KΩ 5%	½	URD-1099		
R71	300KΩ 5%	½	URD-1108		
R72	47KΩ	½	URD-089		
R73	82KΩ	½	URD-095		
R74	2.2Meg	½	URD-129		
R75	2.2Meg	½	URD-129		
R76	10KΩ	1	URE-073		
R77	12KΩ	2	URF-075		
R78	47KΩ	½	URD-089		
R79	33KΩ	½	URD-085		
R80	33KΩ	½	URD-085		
R81	47KΩ	½	URD-089		
R82	47KΩ	½	URD-089		
R83	5.6MEg	½	URD-139		

ITEM No.	RATING OHMS	RATING WATT	REPLACEMENT DATA General Electric PART No.	IRC PART No.	NOTES
R84	33KΩ	½	URD-085		
R85	33KΩ	½	URD-085		
R86	33KΩ	½	URD-085		
R87	10KΩ	½	URD-073		
R88	2.2Meg	½	URD-129		
R89	47Ω	½	URD-017	BTS-47	
R90	470Ω	2	URF-041	BTB-470	
R91	330Ω 5%	2	URF-037		
R92	4700Ω	2	URF-065		
R93	3300Ω	1	URD-061		
R94	180KΩ	1	URE-091		
R95	2200Ω				
R96	2200Ω				
R97	820KΩ 5%	1	URD-1120		
R98	910KΩ 5%	1	URD-1120		
R99	150KΩ	1	URE-091		
R100	560KΩ	1	URD-115		
R101	3300Ω 5%	1	URD-1061		
R102	820KΩ	1	URD-119		
R103	39KΩ	1	URD-087		
R104	330KΩ	1	URE-109		
R105	330KΩ	1	URE-109		
R106	820Ω	1	URD-047		
R107	12KΩ	1	URE-075		
R108	2.2Meg	1	URD-129		
R109	12KΩ 5%	1	URD-1076		
R110	82KΩ	1	URD-095		
R111	12KΩ	1	URD-075		
R113	1Meg	½	URD-121		
R113	330Ω	1	URD-057		
R114	10KΩ	2	URF-073		
R115	1500Ω	2	URF-053		
R116	1500Ω	2	URF-053		
R117	220KΩ	½	URD-105		
R118	3.9Ω	1	N-PRE-003		
R119	2200Ω	1	URD-057		
R120	330Ω	½	URD-037		
R121	3300Ω	10	RRW-099	PW10-3300	
R122	680Ω	½	URD-045	BTS-680	
R123	330Ω	1	URE-037	BTA-330	
R124	470KΩ	1	URD-113	BTS-470K	

† Items R56, C82A, C82B, C82C are combined in one unit.
Note 1. Some versions use a 8200Ω, 2 watt resistor in this application.

TRANSFORMER (POWER)

ITEM No.	RATING	REPLACEMENT DATA General Electric PART No.	Halldorson PART No.	Merit PART No.	RCA TYPE No.	Stancor PART No.	Thordarson PART No.	Triad PART No.
T1	PRI SEC 1 SEC 2 117VAC 560VCT 5VAC @ 1.74A .285ADC @ 3A SEC 3 SEC 4 SEC 5 6.3VAC @ 8.5A	RTP-327	P9739 ①	P-2636 ②				

① Tape 5, 5V @ 4.5A winding, fabricate mounting.
② Tape 6, 5V @ 1.2A winding, fabricate mounting.

TRANSFORMERS (SWEEP CIRCUITS)

ITEM No.	USE	REPLACEMENT DATA General Electric PART No.	Halldorson PART No.	Merit PART No.	RCA TYPE No.	Rom PART No.	Stancor PART No.	Thordarson PART No.	Triad PART No.
T2	Horiz. Output Trans.	RTO-165 ①							
T3	Vert. Output Trans.	RTO-155	Z1900 ②③	A-3233 ③		V302 ②③	A-8144 ② ⑤	26S73 ⑤	A-106X ④
T4A	Yoke (90°) Horiz. (12MM)	RLD-069 ④							
B	Vert. (42MM)								
T5	Horiz. Lin. Coil (6.5-17MH)	RLD-060	RF500 ⑤ ⑥	MWC-1 ⑥ ⑦	30HR3	20HR10 ⑤	WC-5 ⑤ ⑦	WC-18 ⑥	WC-12 ⑦
T6A	Width Coil (1.1-8.5MH)	RLD-058						WC-21	
B	(.17-1.6MH)								

① Is some versions part # RTO-174 was used in this application. When replacing RTO-174, use RTO-165 and change R114 (screen resistor of V15, horizontal output tube) to 15,000Ω, 2 watt.
② Drill new mounting hole(s).
③ Connect as auto transformer.
④ Yoke assembly includes resistors R95, R96.
⑤ Connect to terminals #1 and #2 .
⑥ Enlarge mounting hole.
⑦ Connect to coded red and blue terminals.
⑧ Use 8 to 1 turns ratio.

TRANSFORMER (AUDIO OUTPUT)

ITEM No.	IMPEDANCE PRI.	IMPEDANCE SEC.	REPLACEMENT DATA General Electric PART No.	Halldorson PART No.	Merit PART No.	Stancor PART No.	Thordarson PART No.	Triad PART No.	NOTES
T7	11.6KΩ	3.5Ω	RTO-170			A-3233			

SPEAKER

ITEM No.	RATINGS SIZE	RATINGS FIELD	RATINGS V C IMP	REPLACEMENT DATA General Electric PART No.	QUAM PART No	NOTES
SP1	10"	PM	3.2Ω	ROP-018 ①	10A31	① Used in models 21C130, 21C131, 21C151, 21C152, 21C156, and 21C157.
	8"	PM	3.2Ω	3800-DT ②	8A31	② Used in models 21C40, 21C151, 21C153, 21C156, and 21C157.

COILS (RF-IF)

ITEM No.	USE	DC RES PRI	DC RES SEC	REPLACEMENT DATA General Electric PART No	MEISSNER PART No	MERIT PART No	MILLER PART No	NOTES
L1	VHF antenna trans.	.2ΩCT	.1Ω*	RLA-043				*Tapped
L2	IF trap	.2Ω		RLI-284				
L3	VHF antenna coil	0Ω		RSX-048				Channel 6-Part of complete assembly. High channels-Part of complete assembly.
L4	VHF antenna coils	0Ω		RSX-048				Low channels-Part of complete assembly.
L5	VHF antenna coils	0Ω		RSX-047				Channel 13-Part of complete assembly.
L6	VHF antenna coil	0Ω		RSX-046				
L7	Mixer coil	0Ω		RLI-289				
L8	UHF IF coil	.1Ω	0Ω	RTL-181				
L9	VHF RF coil	0Ω		RSX-044				Channel 13-Part of complete assembly. Part of complete assy. Channel 6-Part of complete assembly. Part of complete assy.
L10	VHF RF coils	0Ω		RSX-044				
L11	VHF RF coil	0Ω		RSX-044				
L12	UHF IF coil	0Ω		RSX-044				
L13	Hi-band coupling strap	0Ω						
L14	VHF Mixer grid coil	0Ω		RSX-043				Channel 13-Part of complete assembly.
L15	VHF mixer grid coils	0Ω		RSX-043				Part of complete assy.
L16	VHF mixer grid coil	0Ω		RSX-043				Channel 6-Part of complete assembly.
L17	UHF IF coil	0Ω		RSX-043				Part of complete assy.
L18	VHF Osc.	0Ω		RSX-042				Part of complete assy.
L19	VHF Osc. coil	0Ω		RSX-042				Channel 13-Part of complete assembly.
L20	RF coil	0Ω						
L21	RF choke	0Ω		RLI-295				
L22	Conv. choke	.1Ω		RLI-285				
L23	39MC trap	0Ω		RLI-332	17-4501▲			Core Part No. RE1-052
L24	41.25MC trap	0Ω		N-RLI-325	17-4500▲	TV-132▲	6226▲	Core Part No. RE1-052
L25	47.25MC trap	0Ω		N-RLI-326	17-4502▲	TV-134▲	[illegible]	Core Part No. RE1-052
L26	1st Video IF	0Ω		N-RLI-322	17-4500▲	TV-130▲	6226▲	Core Part No. RE1-052
L27	2nd Video IF	.1Ω	.1Ω	N-RTL-178	17-4533▲	TV-130▲	6616▲	Core Part No. RE1-052
L28	3rd Video IF	.1Ω	.1Ω	N-RTL-178	17-4533▲	TV-130▲	[illegible]	Core Part No. RE1-052
L29	4th Video IF	.1Ω	.1Ω	N-RTL-179	17-4534▲	TV-130▲	[illegible]	Core Part No. RE1-052
L30	Series peaking coil	5.3Ω		RLI-153	19-1005		4612	10 Microhenries, IRC Part No. CL-1.
L31	Series peaking coil	2.3Ω		RLP-034	19-8033	TV-160	6176	31 Microhenries
L32	Shunt peaking coil	6.8Ω		N-RLI-331	19-8350	TV-165	6151	240 Microhenries
L33	Series peaking coil	2.7Ω		N-RLI-332	19-7068†		6172†	68 Microhenries, wound on 4.7KΩ resistor.
L34	Cathode choke	1.8Ω		RLI-285	19-1002		[illegible]	2.2 Microhenries, IRC Part No. CL-A
L35	4.5MC trap	1.9Ω		N-RLI-324	20-1004▲	TV-151▲	1466▲	Core Part No. N-RE1-053
L36	Series peaking coil	6.5Ω		RLI-310	19-3180▲	TV-154▲	6180▲	180 Microhenries, wound on 22KΩ resistor
L37	Shunt peaking coil	4.8Ω		RLI-283	19-3160		6120	150 Microhenries
L38	RF choke	3.2Ω		RLI-280	19-7068		6172	68 Microhenries
L39	Sound IF	3.8Ω	3.8Ω	RLI-320	17-1002▲	TV-108	1466▲	Core Part No. RE1-016
L40	Ratio Det.	5.3Ω	.5Ω CT	RTD-018				Tertiary winding-.6Ω includes 120Ω resistor. Core Part Prt.-RE1-033
L41	Ringing coil	73Ω		RLI-247	19-1578†	TV-163†	6211†	Core Part No. Sec.-RE1-061
L43	RF choke	8.3Ω		RLI-153	19-1005		4612	Core Part No. N-RE1-064 10 Microhenries, IRC Part No. CL-1

*Drill mounting hole & use trap winding only.
●Drill mounting hole.
▲Drill mounting hole & deburr trap.
•Parallel with 22KΩ resistor.
†Parallel with 4.7KΩ resistor.
●Drill one new mounting hole.
▲Drill new mounting holes.
¶Enlarge mounting hole.
†*Use trap winding only.

FILTER CHOKE

ITEM No	RATINGS TOTAL DIRECT CURRENT	RATINGS D.C. RESISTANCE	RATINGS INDUCTANCE 10 CURRENT 1000 ~(.)	REPLACEMENT DATA General Electric PART No	Halldorson PART No.	Merit PART No	Stancor PART No	Thordarson PART No	Triad PART No
L42	250ADC	50Ω	1.62HY	RLF-062	C5037	C-2296.)	C-3228 ①	20C44	C-33X

PARTS LIST AND DESCRIPTIONS (Continued)

FUSES

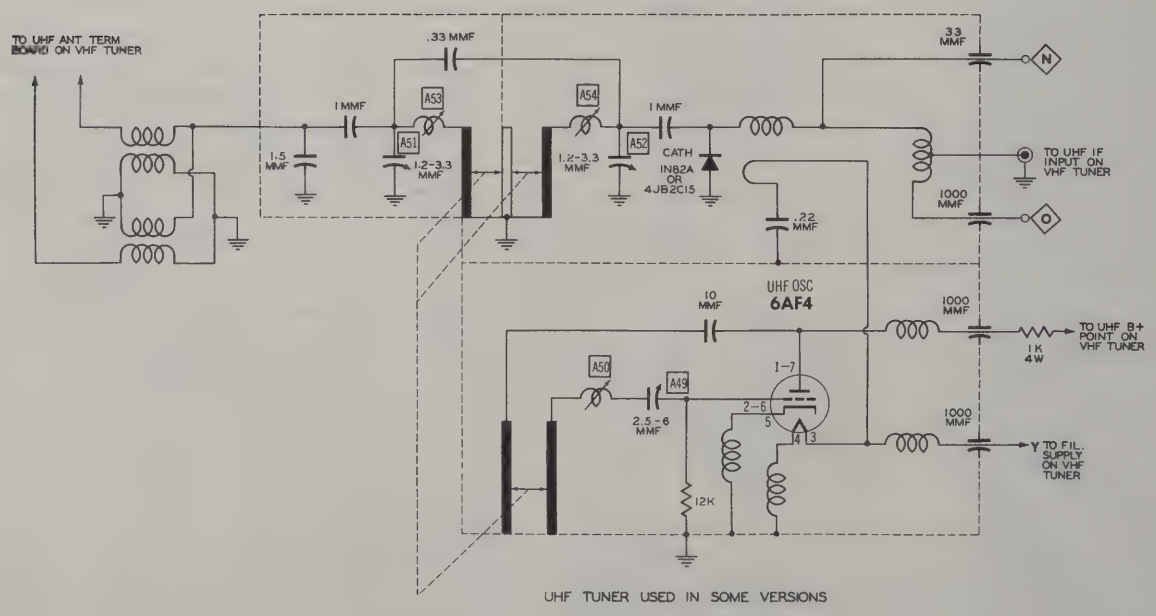
ITEM No.	TYPE	RATING	REPLACEMENT DATA					
			General Electric PART No.		LITTELFUSE PART No.		BUSS PART No.	
			FUSE	HOLDER	FUSE	HOLDER	FUSE	HOLDER
M1	3AG S/B	4A 125V	REF-010	RJB-049	313004 (3AG S/B-4A)	357001 (2 required)	MDX4	4405 (2 required)
M2	3AG	3/8A	REF-012		312.375 (3AG-3/8A)	121004 (2 required)	AGC 3/8	4548 (2 required)

CRYSTAL DIODES

ITEM No.	ORIG. TYPE	REPLACEMENT DATA		NOTES
		General Electric PART No.	SYLVANIA PART No.	
M3	1N87	RED-001	1N60/1N132	Video Detector

MISCELLANEOUS

ITEM No.	PART NAME	General Electric PART No.	NOTES
M4	Tuner	RJX-073	VHF- VHF only or VHF-UHF models
M5	Tuner	RUX-008	UHF - VHF-UHF models, Not used in some versions
	Tuner	RUX-009	UHF - VHF-UHF models, Used in some versions.
M6	Switch	RSS-011	Ant. Local-Distant (DPDT - Slide Type)
M7	Centering Device	REA-008	
M8	Ion Trap	RET-013	
	Cabinet	N-RAV-270	Model 21C130
	Cabinet	N-RAV-271	Model 21C131
	Cabinet	N-RAV-272	Model 21C151
	Cabinet	N-RAV-273	Model 21C152
	Cabinet	N-RAV-274	Model 21C156
	Cabinet	N-RAV-275	Model 21C157
	Cabinet	N-RAV-276	Model 21C40
	Knob	RDK-469	VHF channel Selector - Models 21C40, 21C130, 21C131, 21C151, 21C152
	Knob	N-RDK-479	UHF Channel Selector - Models 21C156, 21C157,
	Knob	RDK-470	Fine tuning
	Knob	RDK-471	UHF Dial
	Knob	N-RDK-475	Volume
	Knob	N-RDK-476	Contrast
	Knob	N-RDK-477	Tone and range
	Knob	N-RDK-478	Brightness and vertical hold
	Safety Glass	N-RDW-089	
	Mask	N-RDM-061	Models 21C40, 21C130, 21C151, 21C156
	Mask	N-RDM-062	Models 21C131, 21C152, 21C157



UHF TUNER USED IN SOME VERSIONS

A PHOTOFACT STANDARD NOTATION SCHEMATIC

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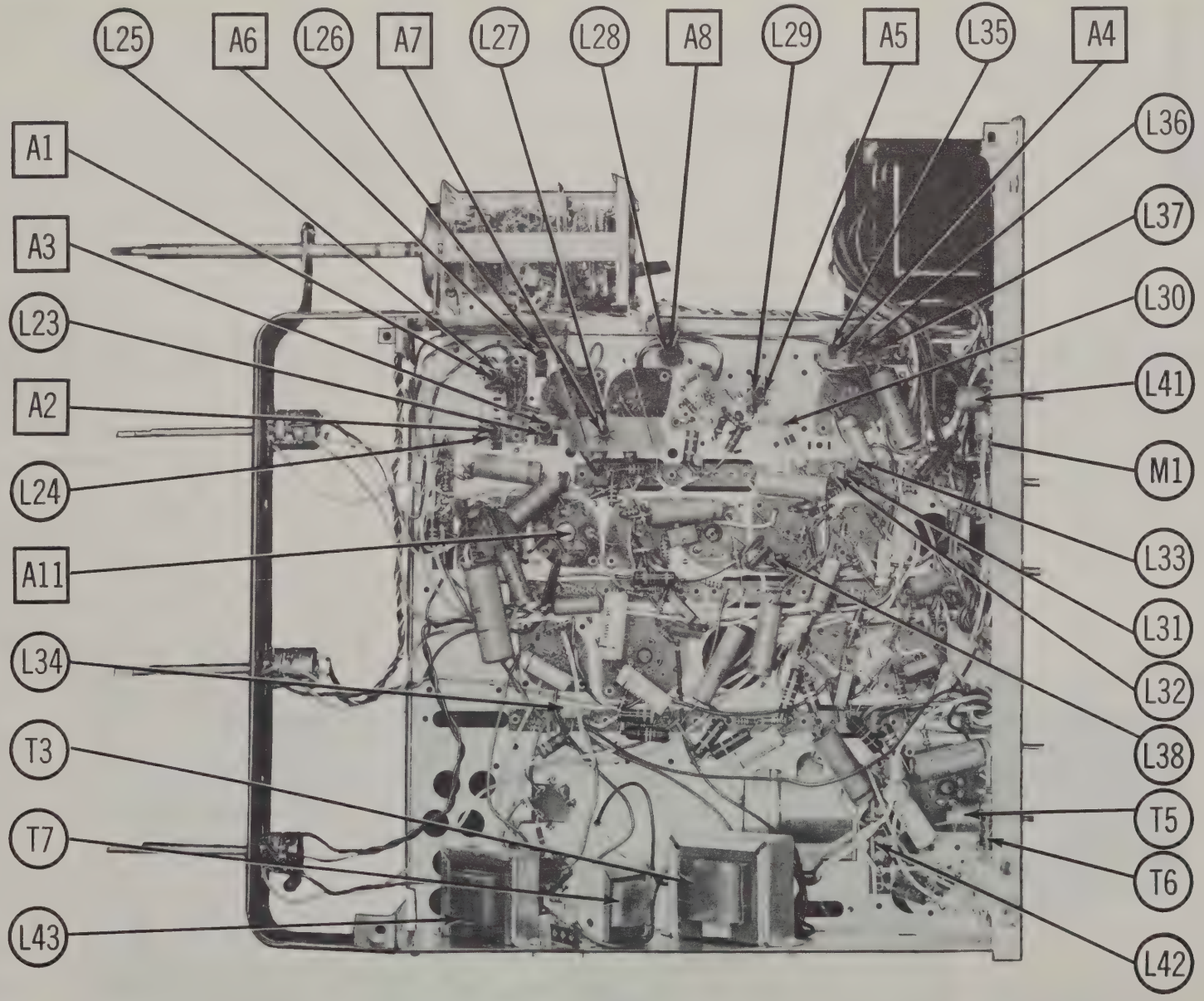
UHF TUNER SCHEMATIC



CHASSIS BOTTOM VIEW-TRANS., INDUCTOR AND ALIGNMENT IDENTIFICATION

PROPERTY OF
L. F. BLANKENSHIP
3924 MEADE ST.
DENVER, COLORADO

TROUBLE SHOOTING AIDS (cont)

HIGH VOLTAGE

LOSS OF HIGH VOLTAGE

Check by substitution V14, V15, V16, and V17. Check fuse, M2. Check waveform W14.

If Satisfactory	If Unsatisfactory
Check T2, T4A, T5, T6, C99, C100, C98, C97, C96, R114 and other associated components.	Check C93, C92, C95, R106, R107, R110, L41 and other associated components.

INSUFFICIENT HIGH VOLTAGE

Check by substitution V15, V16 and V18. Check C95, R114, R111 and other associated components.

BLOOMING

Check by substitution V15, V16, V17 and V18. Check C94, C95, R114, R119 and other associated components.

GENERAL

RASTER, SOUND, NO PICTURE

Follow procedure outlined under "Loss of Video."

RASTER, PICTURE, NO SOUND

Follow procedure outlined under "Weak or no Sound."

RASTER, NO SOUND, NO PICTURE

Check by substitution V1, V2, V3, V4, V5 and V6. Check video IF components for failure or change of value.

NO RASTER, NO SOUND

Follow procedure outlined under "Dead Set."

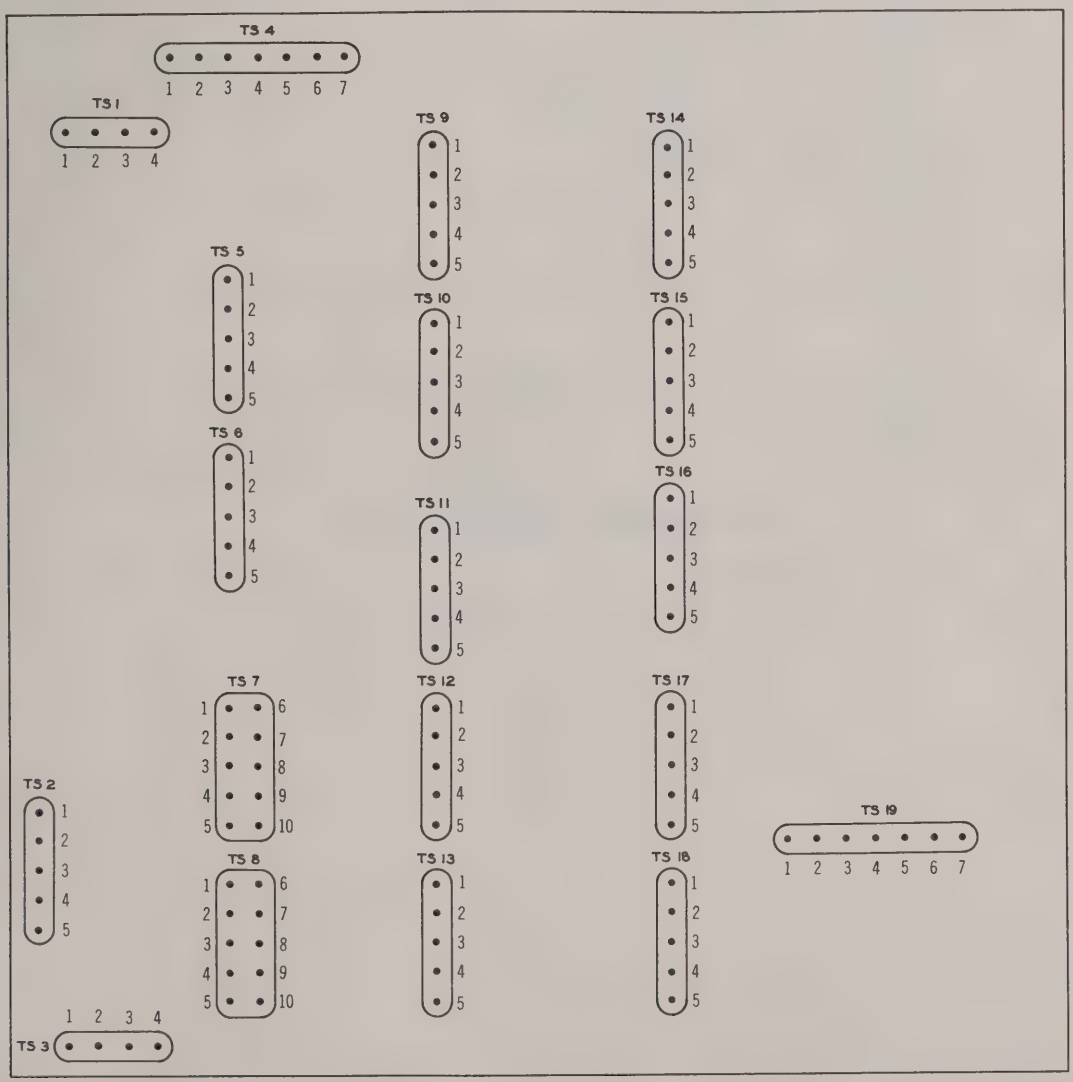
KEYSTONE EFFECT

Check T4 and its associated components.

INTERMITTENT STREAKS

Check high voltage section for corona discharge and arcing.

Symptoms shown are assumed and are not indicative of the quality and workmanship of this equipment.



TERMINAL LOCATION CHART

SERVICING IN THE FIELD

TUNER OSCILLATOR ADJUSTMENTS

Touch-up adjustments of the VHF tuner oscillator circuit may be accomplished by removing the channel selector and fine tuning knobs.

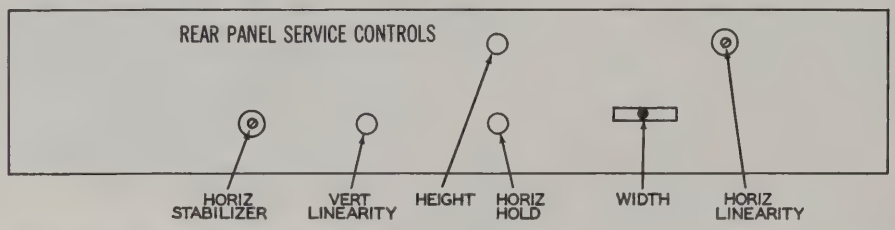
PICTURE TUBE SAFETY GLASS CLEANING

To clean safety glass remove 4 wood screws holding metal strip at the top of the safety glass. Remove metal strip and safety glass. Use extreme caution when removing safety glass.

PICTURE TUBE REMOVAL

For removal of the picture tube, remove safety glass as above. Disconnect yoke plug, picture tube socket and HV lead. Remove ion trap, centering rings and yoke from the neck of the picture. (Use caution when removing yoke). Remove 6 screws (3 on each side) fastening mask to the cabinet side rails. Remove mask assembly and picture tube from the cabinet front. Loosen the spade bolt nut and remove the picture tube mounting band. Remove picture tube from mask.

SERVICE ADJUSTMENT LOCATION



HORIZONTAL OSCILLATOR FIELD ADJUSTMENT

Adjustment of the horizontal oscillator circuit can be made from the rear panel of the chassis. Set the horizontal hold control at its mid-range position and adjust the horizontal stabilizer coil (L41) until the picture synchronizes horizontally.

SOUND IF DETECTOR BUZZ ADJUSTMENT

To eliminate sound IF detector buzz, adjust the ratio detector secondary (L40) located on top of chassis. (See tube placement chart).

FUSES

Two fuses are used. One for horizontal sweep circuit protection and one for LV power supply protection. (For location, see tube placement chart).

CENTERING

Centering is accomplished mechanically by adjusting two magnetic rings around the neck of the picture tube, located flush against the deflection yoke. Rotate the two rings around the neck of the tube until the picture is properly centered.

DISASSEMBLY INSTRUCTIONS

CHASSIS REMOVAL

1. Remove 8 push-on type control knobs from front panel of cabinet.
2. Remove 7 wood screws and 1 metal screw . Remove rear cover.
3. Loosen 2 screws. Remove antenna bracket.
4. Disconnect speaker leads, picture tube socket, yoke socket and HV lead.
5. Remove 4 chassis bolts. Remove chassis.
6. Remove 4 speaker nuts. Remove speaker.

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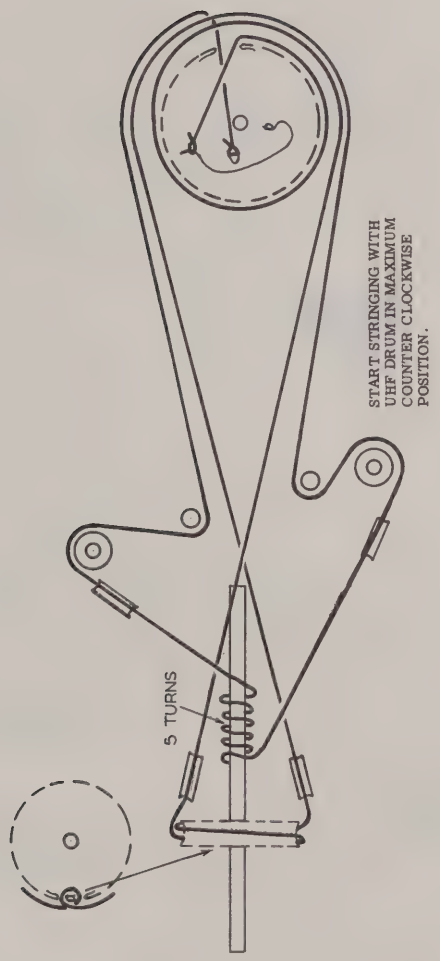
UHF DRIVE CORD STRINGING



PROPERTY OF
L. F. BLANKENSHIP
3924 MEADE ST.
DENVER, COLORADO

DON MC GOHAN
MODEL WA-325

DON MC GOHAN
MODEL WA-325

TRADE NAME	Don McGohan Model WA-325
MANUFACTURER	Don McGohan, Inc., 3700 W. Roosevelt Rd., Chicago 24, Ill.
TYPE SET	AC Operated Audio Amplifier
TUBES (Five)	Types 6SN7GTA AF Amp., 6SN7GTA AF Amp. -Phase Inv., (2) KT66 Output, 5V4G Rectifier
POWER SUPPLY	110-120 Volts AC-50/60 Cycles
RATING	.57 Amp. @ 117 Volts AC

HOWARD W. SAMS & CO., INC. • Indianapolis 5, Indiana

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PARTS LIST AND DESCRIPTIONS

MC GOHAN
Model WA-325

TUBES (SYLVANIA, GENERAL ELECTRIC, WESTINGHOUSE)

ITEM No.	USE	REPLACEMENT DATA		RETMA BASE TYPE	NOTES
		MC GOHAN PART No.	STANDARD REPLACEMENT		
V1	AF Amp.	6SN7GTA	6SN7GTA	8BD	
V2	AF Amp. - Phase Inv.	6SN7GTA	6SN7GTA	8BD	
V3	Audio Output	KT66	KT66	7S	
V4	Audio Output	KT66	KT66	7S	
V5	Rectifier	5V4G	5V4G	5L	

CAPACITORS

Capacity values given in the rating column are in mfd. for Electrolytic and Paper Capacitors, and in mmfd. for Mica and Ceramic Capacitors.

ITEM No.	RATING		REPLACEMENT DATA						
	CAP.	VOLT	MC GOHAN PART No.	CENTRALAB PART No.	ERIE PART No.	MALLORY PART No.	PYRAMID PART No.	SANGAMO PART No.	
C1	16	525					TD-16-525		
C2A	▲20	500				FP284	TM-D20-500	D-270	
B	▲20	500							
C3A	▲20	500				FP284	TM-D20-500	D-270	
B	▲20	500							
C4	100	50				TC3501	TD-100-50	MTH-5010	
C5	.25	600				PT6025	IMP6-P25	3306025	
C6	.25	600				PT6025	IMP6-P25	3306025	
C7	.25	600				PT6025	IMP6-P25	3306025	
C8	.25	600				PT6025	IMP6-P25	3306025	
C9	.25	600				PT6025	IMP6-P25	3306025	
C10	100					UC-531		K-1310	

CONTROLS

ITEM No.	RATING		REPLACEMENT DATA					INSTALLATION NOTES
	RESISTANCE	WATTS	MC GOHAN PART No.	IRC PART No.	CLAROSTAT PART No.	CENTRALAB PART No.	MALLORY PART No.	
R1A	100Ω	4	6830	4WK-100	A10-100	SVP-983	M100PK	Balance Wire-Wound
B	Shaft		Not Req.	Not Req.	FKS-1/4	Not Req.	Not Req.	Attach to R1A

RESISTORS

ITEM No.	RATING		REPLACEMENT DATA		NOTES
	OHMS	WATT	MC GOHAN PART No.	IRC PART No.	
R2	470KΩ	½		BTS-470K	
R3	10KΩ	½		BTS-10K	
R4	470Ω	½		BTS-470	
R5	47KΩ	1		BTA-47K	
R6	10KΩ	½		BTS-10K	
R7	22KΩ	1		BTA-22K	
R8	22KΩ	1		BTA-22K	
R9	22KΩ	1		BTA-22K	
R10	33KΩ	1		BTA-33K	
R11	470KΩ	½		BTS-470K	
R12	560Ω	½		BTS-560	
R13	47KΩ	2		BTB-47K	

ITEM No.	RATING		REPLACEMENT DATA		NOTES
	OHMS	WATT	MC GOHAN PART No.	IRC PART No.	
R14	470KΩ	½		BTS-470K	
R15	47KΩ	2		BTB-47K	
R16	100K	½		BTS-100K	
R17	1000Ω	½		BTS-1000	
R18	600Ω	10			
R19	100Ω	1		BTA-100	
R20	100KΩ	½		BTS-100K	
R21	1000Ω	½		BTS-1000	
R22	600Ω	10			
R23	100Ω	1		BTA-100	
R24	15KΩ	½		BTS-15K	Note 1

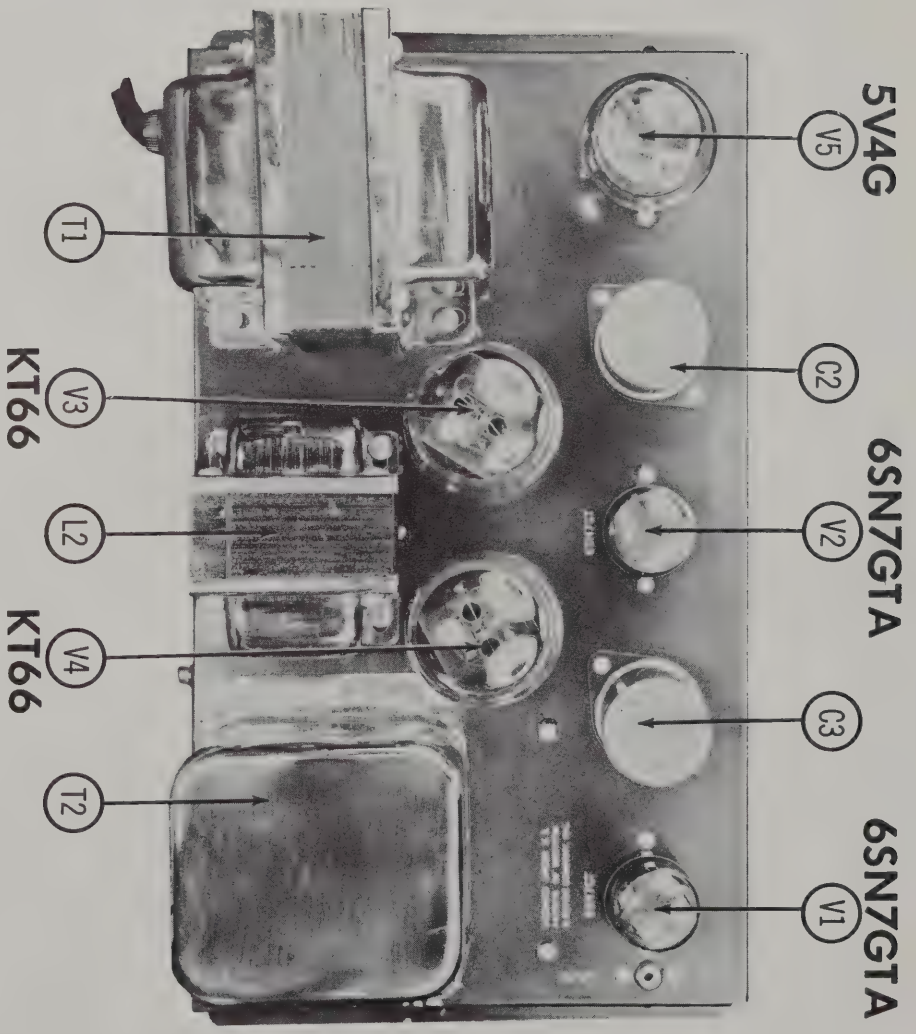
Note 1. Some versions use an 18KΩ resistor in this application.

TRANSFORMER (POWER)

ITEM No.	RATING				REPLACEMENT DATA					
	PRI.	SEC. 1	SEC. 2	SEC. 3	MC GOHAN PART No.	Halldorson PART No.	Merit PART No.	Stancor PART No.	Thordarson PART No.	Triad PART No.
T1	117VAC @ .57A	820VCT .138A	5VAC @ 3A	6.3VCT @ 3.76A			P-3155①	P-6143①	24R07U①	

① Drill new mounting holes.

CHASSIS—TOP VIEW



PARTS LIST AND DESCRIPTIONS (Continued)

TRANSFORMER (AUDIO OUTPUT)

ITEM No.	IMPEDANCE PRI.	IMPEDANCE SEC.	REPLACEMENT DATA MC GOHAN PART No.	Halldorson PART No.	Merit PART No.	Stancor PART No.	Thordarson PART No.	Triad PART No.	NOTES
T2	6KΩ CT Tap @100Ω CT RES	16Ω Tap @ 8Ω			A-3100①				① Drill new mounting holes.

FILTER CHOKE

ITEM No.	RATINGS TOTAL DIRECT CURRENT	D. C. RESISTANCE	INDUCTANCE (0 CURRENT 1000 ~)	REPLACEMENT DATA MC GOHAN PART No.	Halldorson PART No.	Merit PART No.	Stancor PART No.	Thordarson PART No.	Triad PART No.
L1	.026A	400Ω	10.4HY		C5010	C-2981①	C-1707	20C52	C-6X①
L2	.138A	160Ω	9HY		C5025②	C-3180②	C1421①	20C54②	

① Drill one new mounting hole.
② Drill new mounting holes.

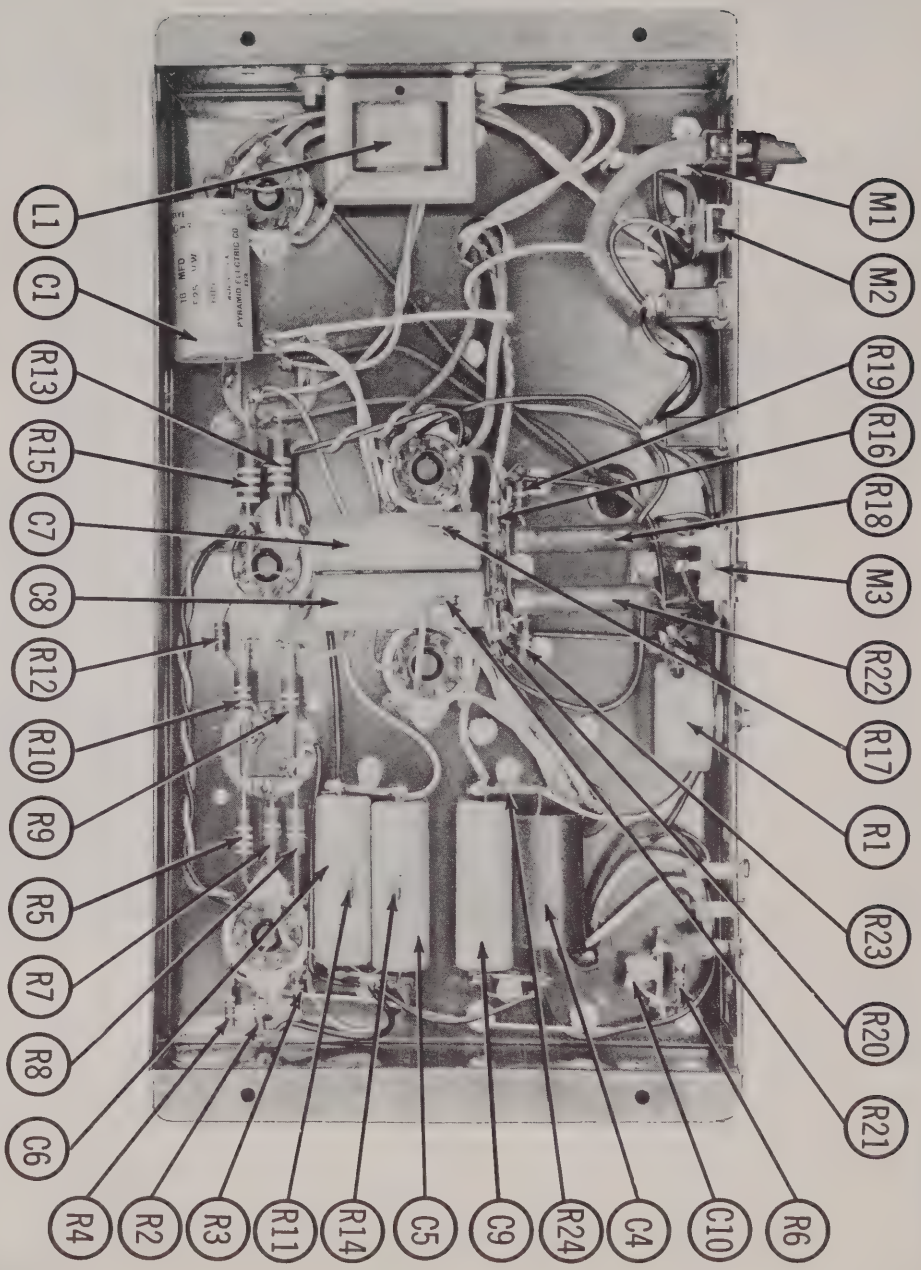
FUSES

ITEM No.	TYPE	RATING	REPLACEMENT DATA MC GOHAN PART No. FUSE	MC GOHAN PART No. HOLDER	LITTELFUSE PART No. FUSE	LITTELFUSE PART No. HOLDER	BUSS PART No. FUSE	BUSS PART No. HOLDER
M1	3AG	3A 250V			312003 (3AG-3A)	342001	AGC3	HKP

MISCELLANEOUS

ITEM No.	PART NAME	MC GOHAN PART No.	NOTES
M2	Switch		On-Off (SPDT-Slide Type)
M3	Switch		Operate-Balance (DPST-Slide Type)

CHASSIS—BOTTOM VIEW



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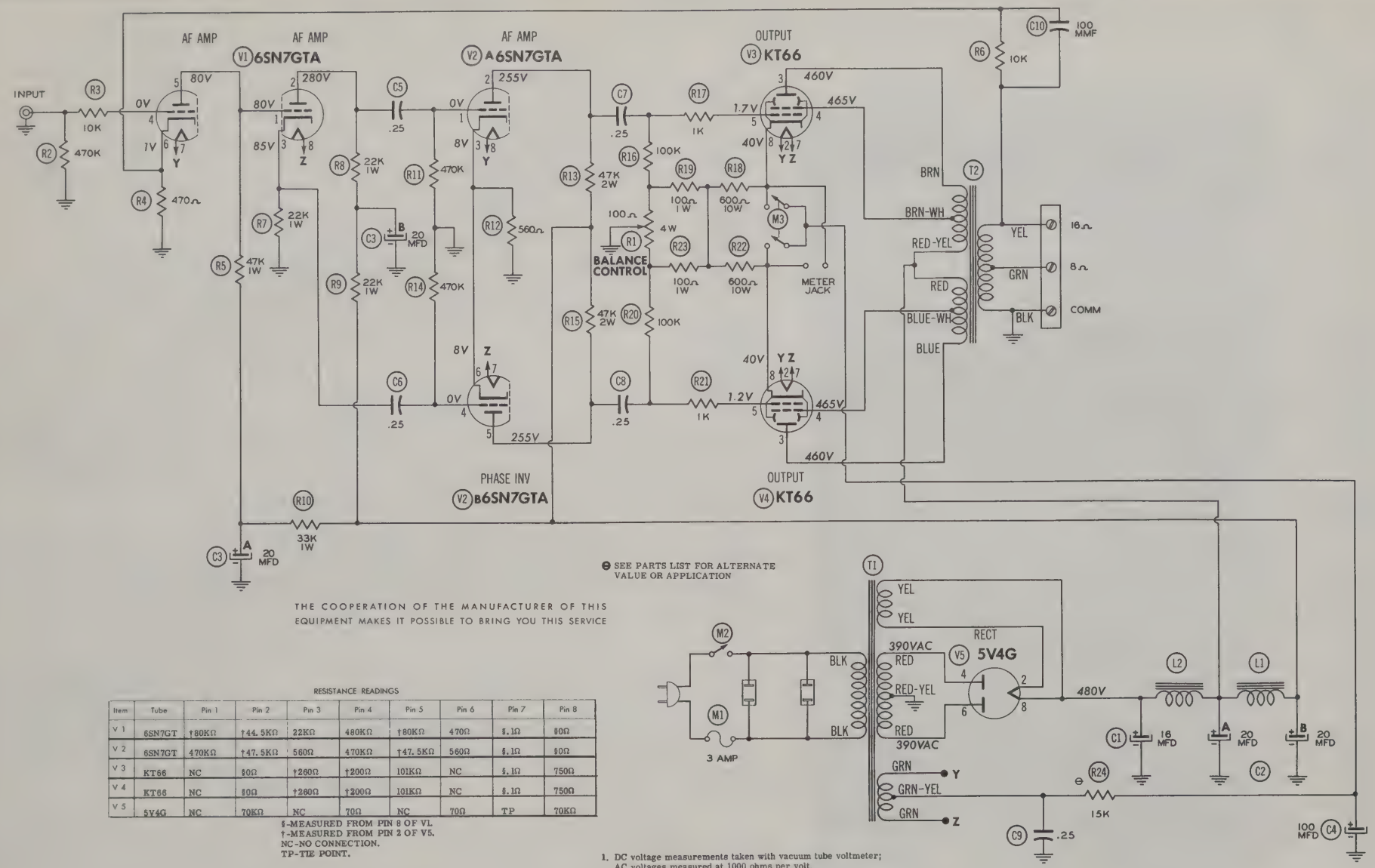
3024 MEADE ST.
DENVER, COLORADO



⊖ SEE PARTS LIST FOR ALTERNATE VALUE OR APPLICATION

THE COOPERATION OF THE MANUFACTURER OF THIS EQUIPMENT MAKES IT POSSIBLE TO BRING YOU THIS SERVICE

RESISTANCE READINGS

Item	Tube	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8
V 1	6SN7GT	†80KΩ	†44.5KΩ	22KΩ	480KΩ	†80KΩ	470Ω	§.1Ω	0Ω
V 2	6SN7GT	470KΩ	†47.5KΩ	560Ω	470KΩ	†47.5KΩ	560Ω	§.1Ω	0Ω
V 3	KT66	NC	0Ω	†260Ω	†200Ω	101KΩ	NC	§.1Ω	750Ω
V 4	KT66	NC	0Ω	†260Ω	†200Ω	101KΩ	NC	§.1Ω	750Ω
V 5	5V4G	NC	70KΩ	NC	70Ω	NC	70Ω	TP	70KΩ

§-MEASURED FROM PIN 8 OF V1.
†-MEASURED FROM PIN 2 OF V5.
NC-NO CONNECTION.
TP-TIE POINT.

1. DC voltage measurements taken with vacuum tube voltmeter; AC voltages measured at 1000 ohms per volt.
2. Socket connections are shown as bottom views.
3. Measured values are from socket pin to common negative.
4. Line voltage maintained at 117 volts for voltage readings.
5. Nominal tolerance on component values makes possible a variation of ± 15% in voltage and resistance readings.
6. All controls at minimum, proper output load connected.

A PHOTOFACT STANDARD NOTATION SCHEMATIC

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RAYTHEON MODELS
8TP-1, -2, -3, -4 (Ch. 8RT1)

PROPERTY OF
L. F. BLANKENSHIP
3024 MEADE ST.
DENVER, COLORADO

RAYTHEON MODELS
8TP-1, -2, -3, -4 (Ch. 8RT1)

TRADE NAME Raytheon Models 8TP-1, 8TP-2, 8TP-3, 8TP-4 (CH. 8RT1)
MANUFACTURER Raytheon Mfg. Co., TV & Radio Div., 5921 Dickens Ave., Chicago 39, Ill.
TYPE SET Battery Operated Portable Transistorized AM Superheterodyne Receiver
POWER SUPPLY 6 Volts DC Battery Supply RATING 15MA @ 6 Volts DC
TUNING RANGE--BROADCAST 540KC-1600KC

ALIGNMENT INSTRUCTIONS—READ CAREFULLY BEFORE ATTEMPTING ALIGNMENT

Volume control should be at maximum position. Output of signal generator should be no higher than necessary to obtain an output reading. Use an insulated alignment screwdriver for adjusting.

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	RADIO DIAL SETTING	OUTPUT METER	ADJUST	REMARKS
1.	.5MFD	High side to base of X1. Low side to chassis.	455KC (400~ Mod.)	Point of non-interference	Across voice coil	A1, A2, A3	Adjust for maximum output. Repeat for best results.
2.	.5MFD	"	1620KC	Tuning gang fully open.	"	A4	Adjust for maximum output.
3.		Loop (Radiated)	1400KC	Tune to 1400KC signal.	"	A5	Adjust for maximum output while rocking tuning gang. Check alignment & dial calibration at 1000KC & 600KC.

HOWARD W. SAMS & CO., INC. • Indianapolis 5, Indiana

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PARTS LIST AND DESCRIPTIONS

TRANSISTORS

ITEM No.	FUNCTION	RAYTHEON PART No.	REMARKS
X1	Mixer	CK760	
X2	Osc.	CK760	
X3	IF Amp.	CK760	
X4	IF Amp.	CK760	
X5	Detector	CK760	
X6	AF Amp.	CK721	CK722 used as alternate
X7	Output	CK721	CK722 used as alternate
X8	Output	CK721	CK722 used as alternate

CAPACITORS

Capacity values given in the rating column are in mfd. for Electrolytic and Paper Capacitors, and in mmfd. for Mica and Ceramic Capacitors.

ITEM No.	RATING CAP.	RATING VOLT	REPLACEMENT DATA RAYTHEON PART No.	CENTRALAB PART No.	ERIE PART No.	MALLORY PART No.	PYRAMID PART No.	SANGAMO PART No.	
C1	2	6	8C-25013			TAW12A2	TD-2-25	MMT-605	
C2	50	6	8C-24903				TD-50-6	MMT-650	
C3	50	6	8C-24903				TD-50-6	MMT-650	
C4	50	6	8C-24903				TD-50-6	MMT-650	
C5	50	6	8C-24903				TD-50-6	MMT-650	
C6	1500		8G-24994		811-152			CR-1215	
C7	.047	200	8D-21823	DF-503		PT4147	IMP2-S47	3302147	
C8	.0047	200	8D-21819	D6-472	GP2-333-472	UC-5247			
C9	390	500	8F15-239					KR-1339	
C10	.068	200	8D-24904						
C11	.01	200	8D-21820	D6-103	GP3-333-103	DC511			
C12	7		8G-24973						
C13	.068	200	8D-24904					KR-1339	
C14	390	500	8F15-239						
C15	.068	200	8D-24904						
C16	.047	200	8D-21823	DF-503		PT4147	IMP2-S47	3302147	
C17	10		8G-12199	TCN-10	N750A-100	NT-541			
C18	.068	200	8D-24904					KR-1339	
C19	390	500	8F15-239						
C20	.068	200	8D-24904						
C21	.047	200	8D-21823	DF-503		PT4147	IMP2-S47	3302147	
C22	.068	200	8D-24904						
C23	.047	200	8D-21823	DF-503		PT4147	IMP2-S47	3302147	Note 1
C24	.0047	200	8D-21819	D6-472	GP2-333-472	UC-5247			
C25	.15	200				PT4015	IMP2-P15	3302015	Note 2

Note 1. Some versions may use a .01MMF unit in this application.
Note 2. Not used in some versions.

CONTROLS

ITEM No.	RATING RESISTANCE	RATING WATTS	REPLACEMENT DATA RAYTHEON PART No.	IRC PART No.	CLAROSTAT PART No.	CENTRALAB PART No.	MALLORY PART No.	INSTALLATION NOTES
R1A	10KΩ	½	10A-24886	Q13-116	A47-10K-Z	AB-15	U-18	Volume
B	Shaft		Not Req.	Not Req.	FS-3	AK-3	Not Req.	Attach to R1A
C	Switch		Not Req.	76-2	SWE-20	KB-2	US-27	Attach to R1A

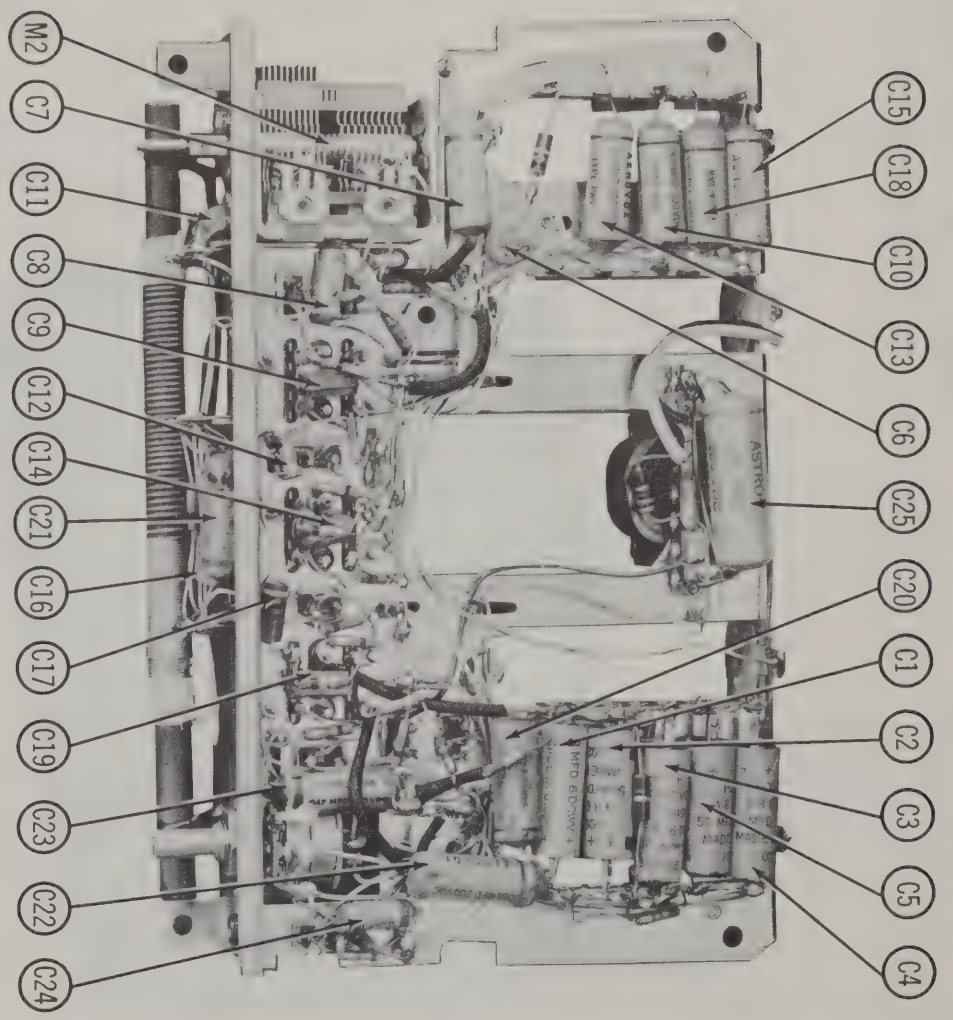
RESISTORS

ITEM No.	RATING OHMS	RATING WATT	REPLACEMENT DATA RAYTHEON PART No.	IRC PART No.	NOTES
R2	3900Ω 5%	1/3	9B3-173	BTR-3900 5%	
R3	2700Ω 5%	1/3	9B3-169	BTR-2700 5%	
R4	100Ω	1/2	9B1-50	BTS-100	Note 1
R5	2700Ω 5%	1/3	9B3-169	BTR-2700 5%	
R6	270Ω	1/3	9B3-55	BTR-270	
R7	100KΩ	1/3	9B3-86	BTR-100K	Note 1
R8	1000Ω 5%	1/3	9B3-159	BTR-1000 5%	
R9	560Ω	1/3	9B3-197	BTR-560	
R10	56KΩ 5%	1/3	9B3-201	BTR-56K 5%	
R11	100KΩ	1/3	9B3-86	BTR-100K	
R12	1000Ω 5%	1/3	9B3-159	BTR-1000 5%	
R13	1000Ω 5%	1/3	9B3-159	BTR-1000 5%	
R14	1Meg	1/3	9B3-98	BTR-1Meg	
R15	220KΩ 5%	1/3	9B3-215	BTR-220K 5%	
R16	100KΩ	1/3	9B3-86	BTR-100K	

ITEM No.	RATING OHMS	RATING WATT	REPLACEMENT DATA RAYTHEON PART No.	IRC PART No.	NOTES
R17	1000Ω 5%	1/3	9B3-159	BTR-1000 5%	
R18	1000Ω 5%	1/3	9B3-159	BTR-1000 5%	
R19	39KΩ 5%	1/3	9B3-153	BTR-39K 5%	
R20	1000Ω 5%	1/3	9B3-159	BTR-1000 5%	
R21	1000Ω 5%	1/3	9B3-159	BTR-1000 5%	
R22	270Ω	1/3	9B3-55	BTR-270	Note 1
R23	56KΩ 5%	1/3	9B3-201	BTR-56K 5%	
R24	10Ω	1/2		BTS-10	Note 1
R25	6800Ω 5%	1/3	9B3-179	BTR-6800 5%	
R26	1500Ω 5%	1/3	9B3-163	BTR-1500 5%	
R27	680Ω	1/3	9B3-155	BTR-680	
R28	100Ω	1/3	9B3-135	BTR-100	
R29	2700Ω 5%	1/3	9B3-169	BTR-2700 5%	
R30	330Ω	1/2		BTS-330	Note 1
R31	100Ω	1/2	9B1-50	BTS-100	

Note 1. Not used in some versions.

CHASSIS—BOTTOM VIEW



PARTS LIST AND DESCRIPTIONS (Continued)

TRANSFORMER (INPUT)

ITEM No.	RATING				REPLACEMENT DATA					
	PRI.	SEC. 1	SEC. 2	SEC. 3	RAYTHEON PART No.	Halldorson PART No.	Merit PART No.	Stancor PART No.	Thordarson PART No.	Triad PART No.
T1	490Ω RES	150Ω CT RES			12C24929					

Turns ratio . 25 to . 75.

TRANSFORMER (AUDIO OUTPUT)

ITEM No.	IMPEDANCE		REPLACEMENT DATA						NOTES
	PRI.	SEC.	RAYTHEON PART No.	Halldorson PART No.	Merit PART No.	Stancor PART No.	Thordarson PART No.	Triad PART No.	
T2	650Ω CT	16. 8Ω	12C-24928						

SPEAKER

ITEM No.	RATINGS			REPLACEMENT DATA		NOTES
	SIZE	FIELD	V. C. IMP.	RAYTHEON PART No.	QUAM PART No.	
SP1	3½"	PM	16. 8Ω	18A-25271	3A07Z16	

COILS (RF-IF)

ITEM No.	USE	DC RES.		REPLACEMENT DATA				NOTES
		PRI.	SEC.	RAYTHEON PART No.	MEISSNER PART No.	MERIT PART No.	MILLER PART No.	
L1	Antenna coil	. 6Ω		13E-24944				Tertiary winding=. 4Ω
L2	Osc. coil	. 5Ω	5. 3Ω▲	13D-24922				▲Tapped @ 2. 3Ω.
L3	1st IF trans.	2. 9Ω	. 8Ω	13A-24949				*Tapped @ L 3Ω
L4	2nd IF trans.	3. 3Ω*	. 7Ω	13M-24951				■Tapped @ L 1Ω
L5	3rd IF trans.	3Ω■	. 7Ω	13B-24950				

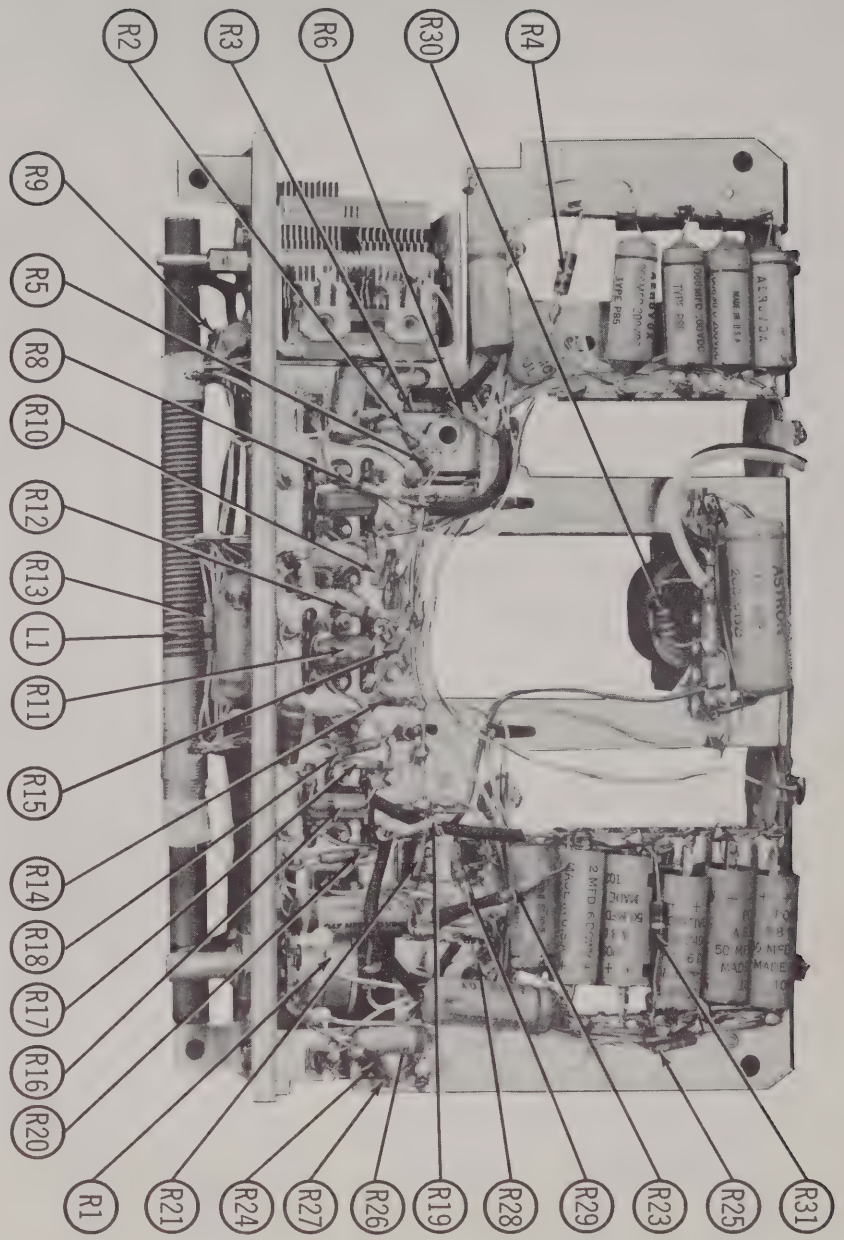
BATTERIES

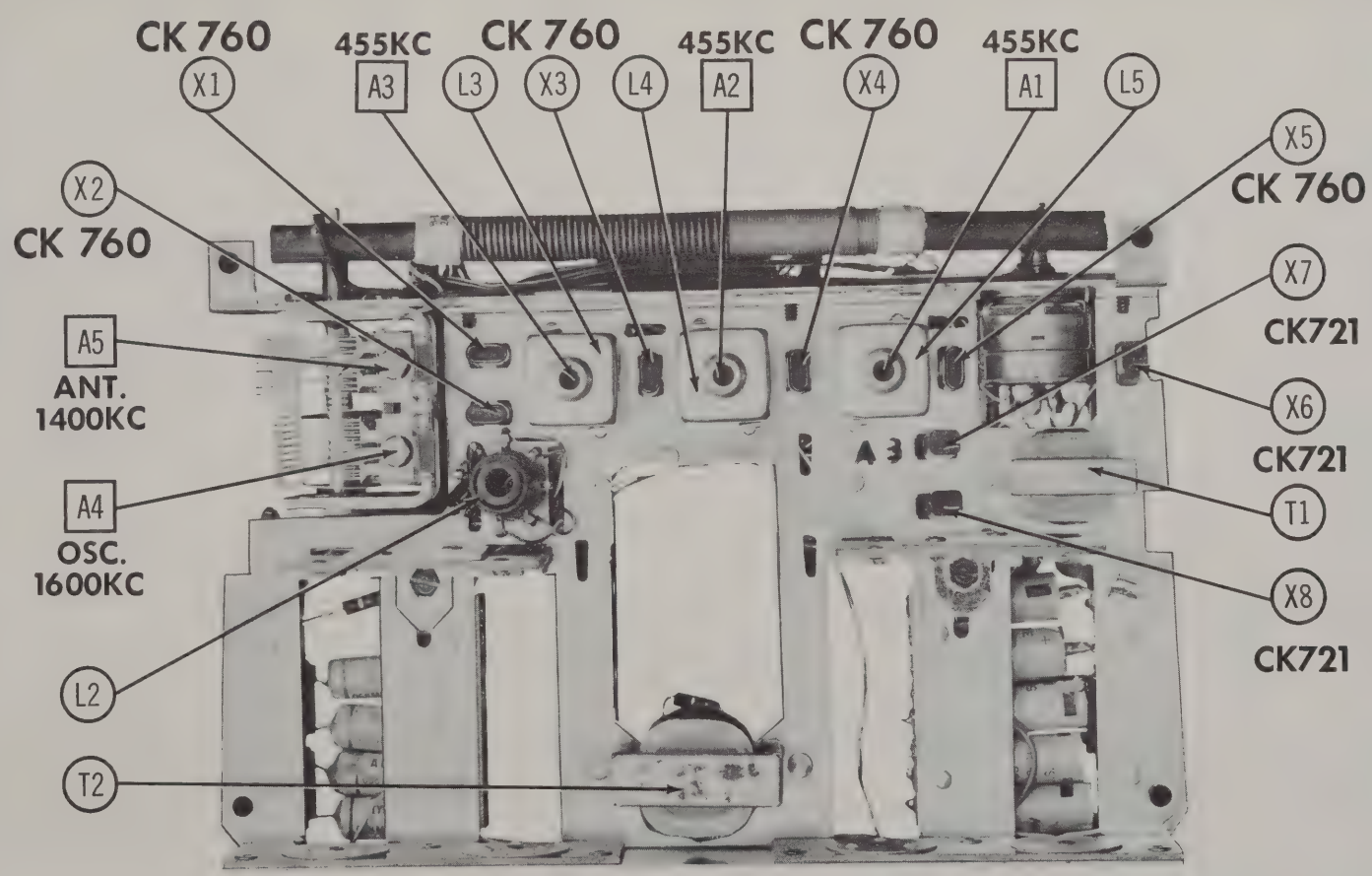
ITEM No.	VOLTAGE	RAYTHEON PART No.	REPLACEMENT DATA						INSTALLATION NOTES
			EVEREADY			BURGESS			
			"A"	"B"	"A-B"	"A"	"B"	"A-B"	
M1	6V "A"		950			2R			Connect 4 in series.

MISCELLANEOUS

ITEM No.	PART NAME	RAYTHEON PART No.	NOTES
M2	Tuning Cap.	8A-24879	2 Gang (26-175MMF, 18-130MMF)
	Case	24D-24885-A173	Model 8TP-1
	Case	24D-24885-A174	Model 8TP-2
	Case	24D-24885-A175	Model 8TP-3
	Case	24D-24885-A176	Model 8TP-4
	Handle	23A-24894-A173	Model 8TP-1
	Handle	23A-24894-A174	Model 8TP-2
	Handle	23A-24894-A175	Model 8TP-3
	Handle	23A-24894-A176	Model 8TP-4
	Knob	200-24932	Tuning Assy. (Includes Tuning Knob, Knob Coupling, & Spring Pin)
	Knob	4B-24918	On-Off-Volume
	Knob	4B-24917	Tuning
	Disc	4B-24920	Tuning

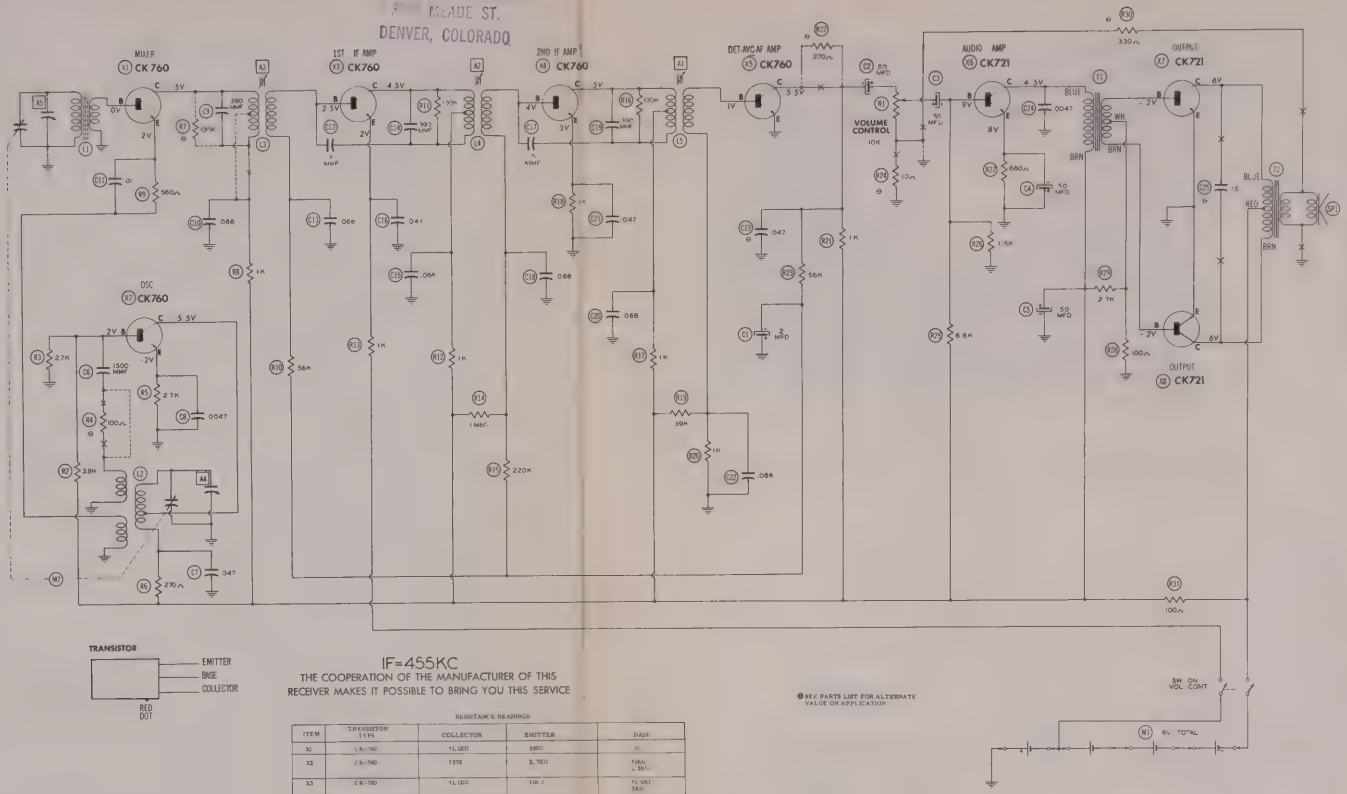
CHASSIS—BOTTOM VIEW





CHASSIS-TOP VIEW

MEADE ST.
DENVER, COLORADO



IF=455KC

THE COOPERATION OF THE MANUFACTURER OF THIS RECEIVER MAKES IT POSSIBLE TO BRING YOU THIS SERVICE

RESISTANCE READINGS

ITEM	TRANSISTOR TYPE	COLLECTOR	EMITTER	BASE
X1	CK-760	*1,100	1600	11
X2	CK-760	†370	2,700	†5K/ 3K/
X3	CK-760	*1,100	†1K/	*1.5K/ 3K/
X4	CK-760	*1,100	1K/	*1.5K/ 3K/
X5	CK-760	*1,100	90	†3K/ 600/
X6	CK-721	†8000	8600	†800/ 8000
X7	CK-721	180	0/1	†50/ 50
X8	CK-721	180	0/1	†80/ 10/

*MEASURED FROM LOW SIDE OF ON-OFF-SWITCH (-8V SUPPLY).
†MEASURED FROM LOW SIDE OF ON-OFF-SWITCH (-6.5 V SUPPLY).
DC RESISTANCE MEASUREMENTS TAKEN WITH OHMMETER WHOSE RESISTANCE RANGES DO NO CONTAIN BATTERY TO EXCEED 8V. POSITIVE LEAD O'S METER (AS DETERMINED BY VOLTMETER) CONNECTED TO CHASSIS.
NO SIGNAL APPLIED FOR VOLTAGE MEASUREMENTS

⊕ SEE PARTS LIST FOR ALTERNATE VALUE OR APPLICATION

A PHOTOFACT STANDARD NOTATION SCHEMATIC
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PHOTOFACT* Folder

SILVERTONE MODELS 5132A, B, 5133A, B, 5134, 5135, 5136, 5137 (Ch. 528.33400, 528.33500, 528.33501, 528.34300, 528.34301, 528.34400)

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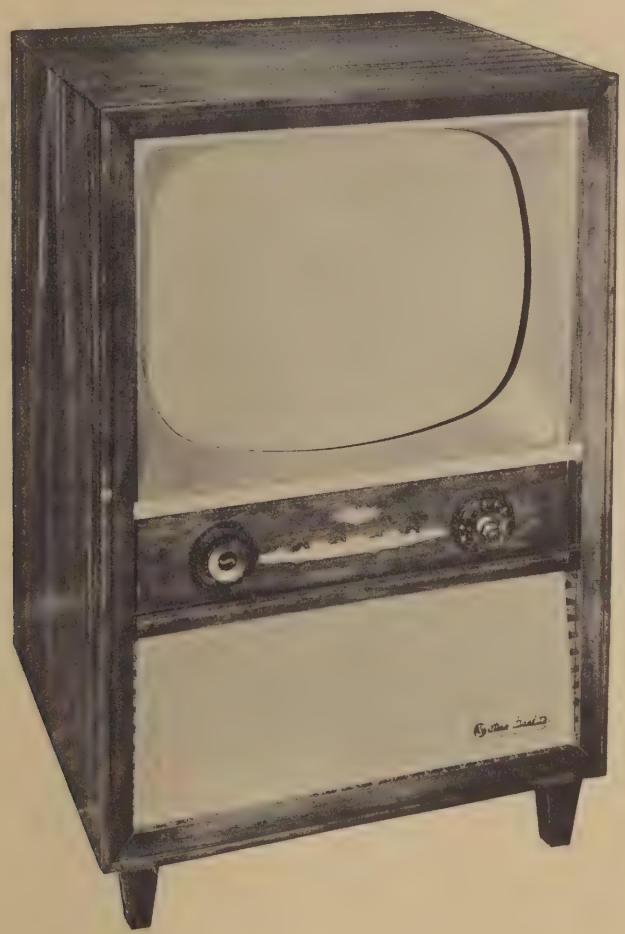

MODEL 5133A

SILVERTONE MODELS 5132A, B, 5133A, B, 5134, 5135, 5136, 5137 (Ch. 528.33400, 528.33500, 528.33501, 528.34300, 528.34301, 528.34400)

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DATE 10–55 SET 292 FOLDER 10

PHOTOFACT* Folder

*TRADE MARK

SILVERTONE MODELS 5132A, B, 5133A, B, 5134, 5135, 5136, 5137 (Ch. 528.33400, 528.33500, 528.33501, 528.34300, 528.34301, 528.34400)

PROPERTY OF
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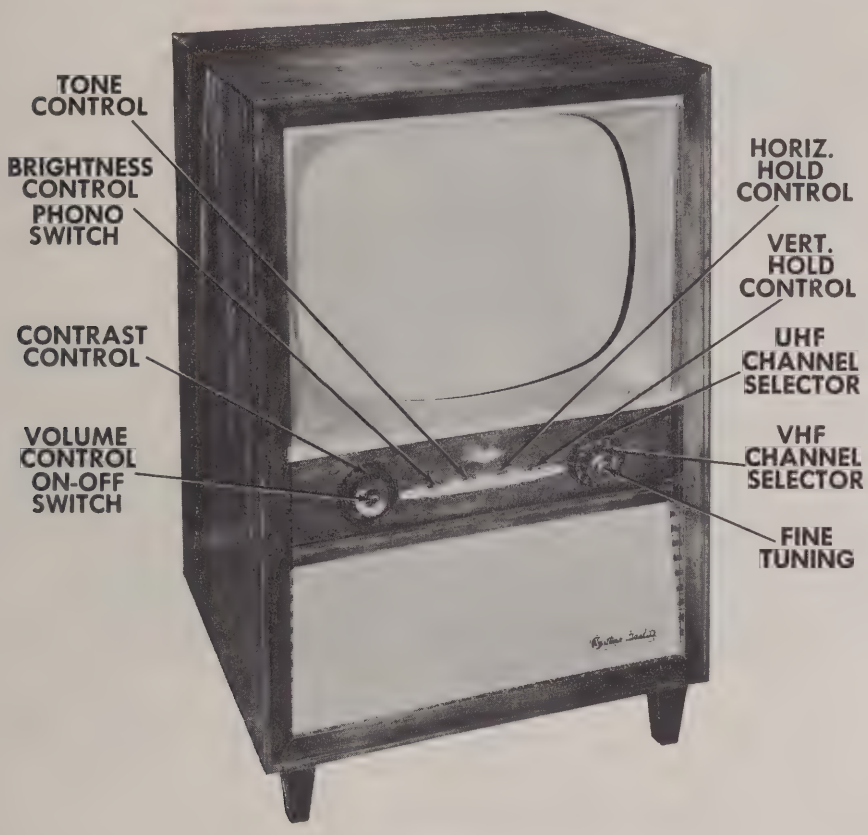

SILVERTONE MODEL 5133A (Ch. 528.33500)

TRADE NAME	Silvertone	MODELS	CHASSIS
		5133A, 5133B, 5135, 5137	528.33400, 528.33500, 528.33501
		5132A, 5132B, 5134, 5136	528.34300, 528.34301, 528.34400
SUPPLIER	Sears Roebuck & Co., 925 S. Homan Ave., Chicago, Ill.		
TYPE SET	Television Receiver		
TUBES	Seventeen		
POWER SUPPLY	110-120 Volts AC-60 Cycles	RATING 1.26 Amp. @ 117 Volts AC	
TUNING RANGE	Channels 2 thru 13 VHF, 14 thru 83 UHF, Video IF 45.75MC, Sound IF 41.25MC (Intercarrier)		

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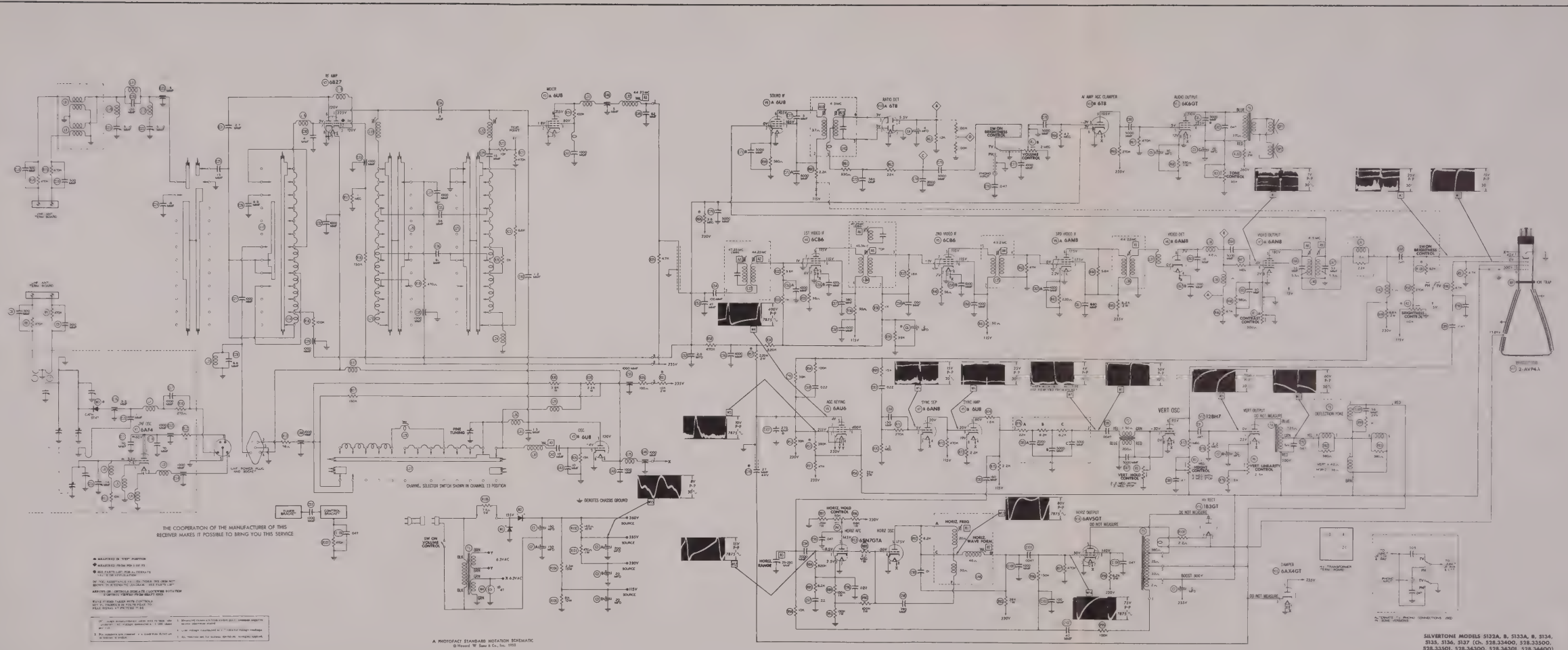
THE COOPERATION OF THE MANUFACTURER OF THIS RECEIVER MAKES IT POSSIBLE TO BRING YOU THIS SERVICE
CHANNEL SELECTOR SWITCH SHOWN IN CHANNEL 13 POSITION
DENOTES CHASSIS GROUND
A PHOTOFACT STANDARD NOTATION SCHEMATIC
© Howard W. Sams & Co., Inc. 1958
SILVERTONE MODELS 5132A, B, 5133A, B, 5134, 5135, 5136, 5137 (Ch. 528.33400, 528.33500, 528.33501, 528.34300, 528.34301, 528.34400)

SILVERTONE MODELS 5132A, B, 5133A, B, 5134, 5135, 5136, 5137 (Ch. 528.33400, 528.33500, 528.33501, 528.34300, 528.34301, 528.34400)

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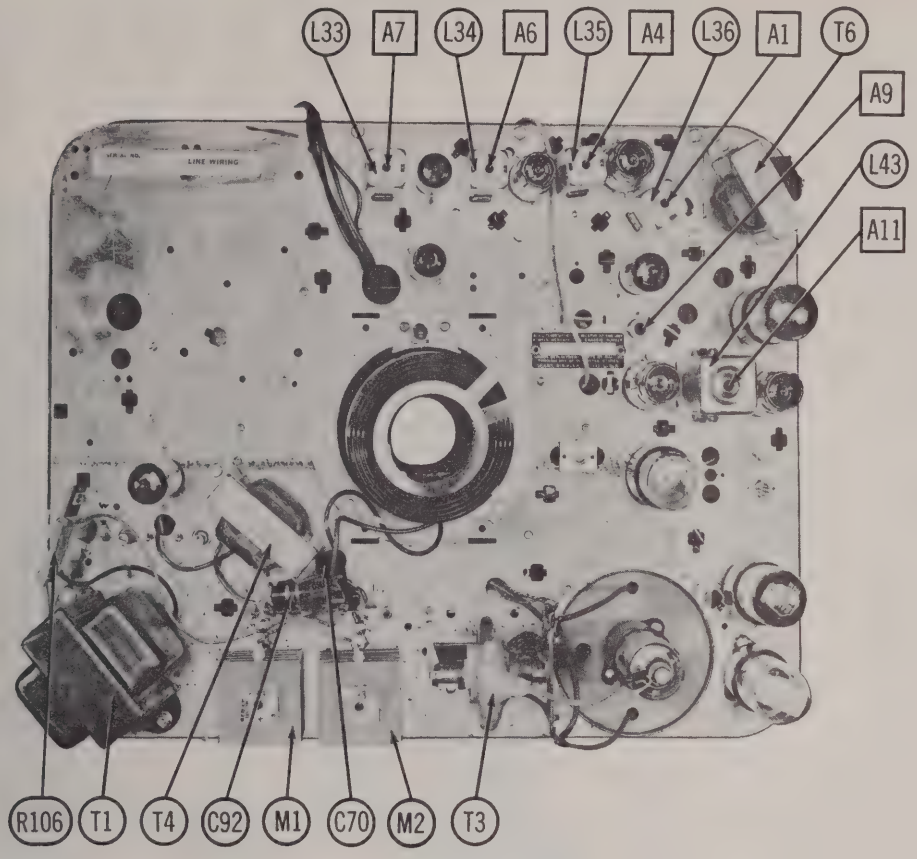
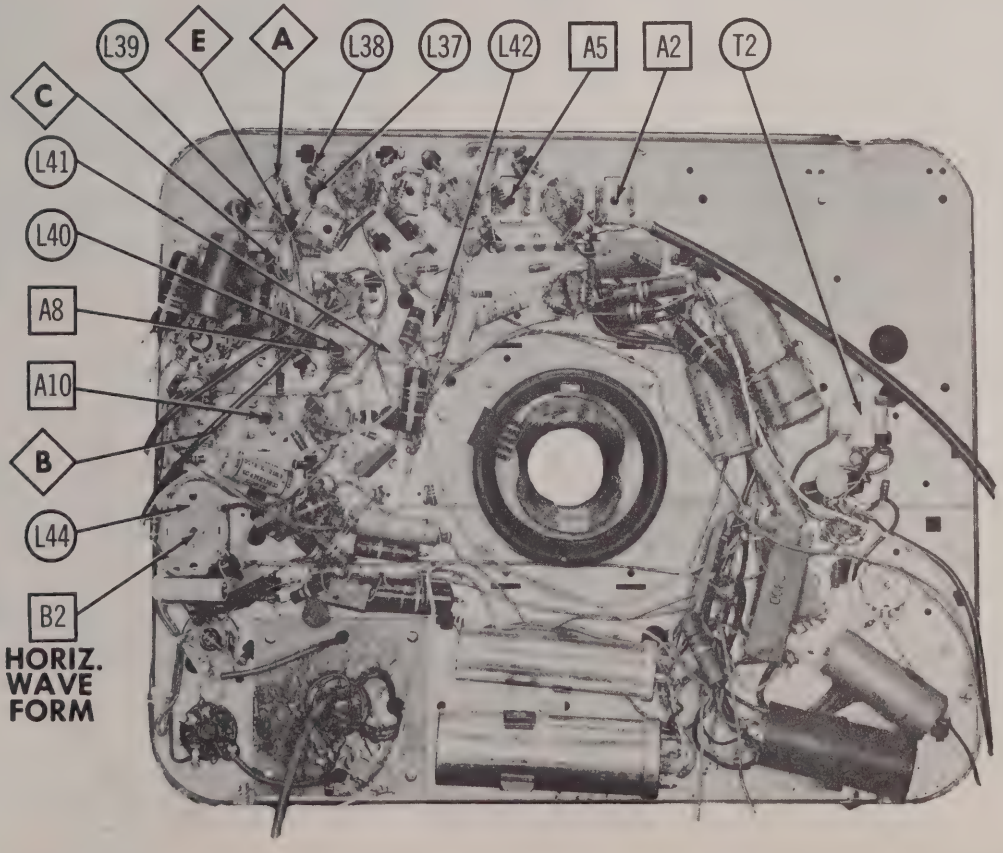
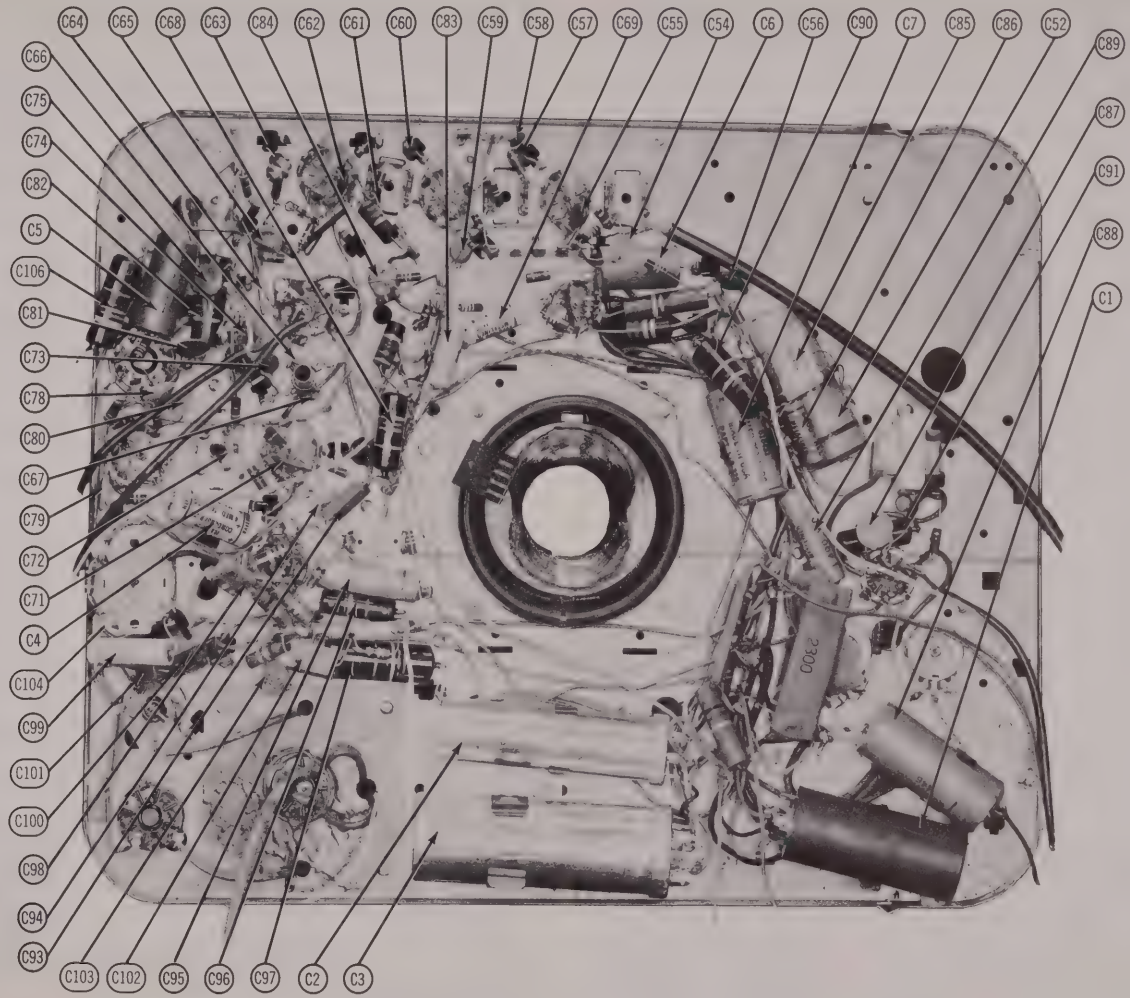


CHASSIS TOP VIEW



CHASSIS BOTTOM VIEW- INDUCTOR AND ALIGNMENT IDENTIFICATION

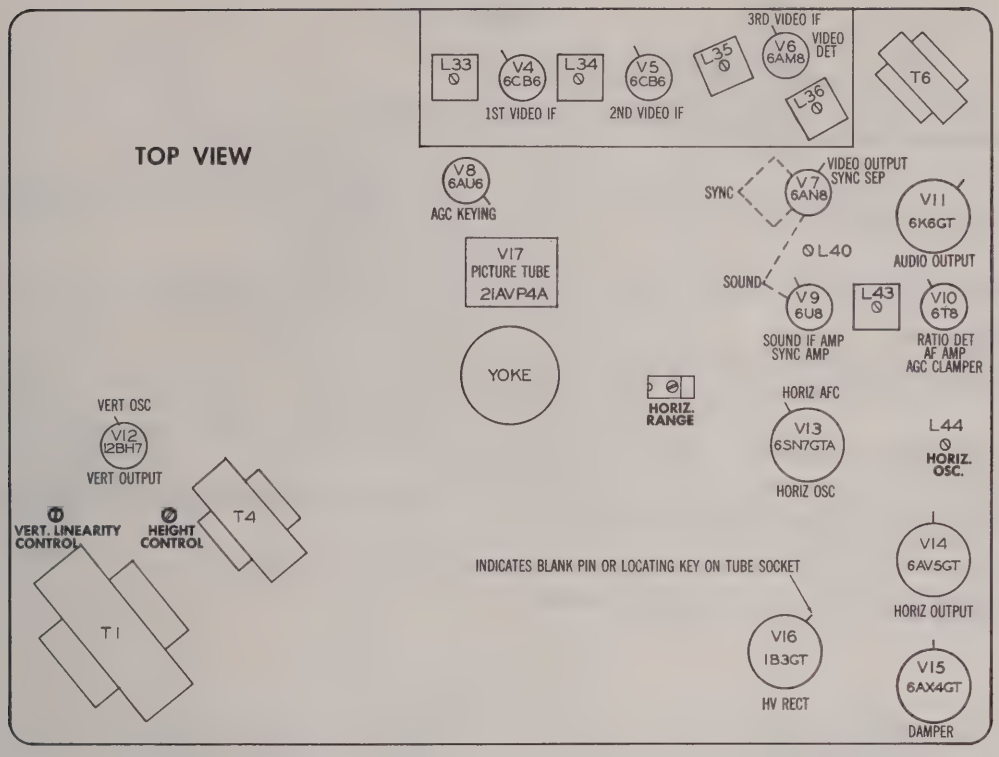
SILVERTONE MODELS 5132A, B, 5133A, B, 5134, 5135, 5136, 5137 (Ch. 528.33400, 528.33500, 528.33501, 528.34300, 528.34301, 528.34400)

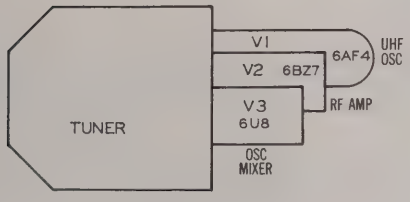


CHASSIS BOTTOM VIEW-CAPACITOR IDENTIFICATION

DENVER, COLORADO

TUBE PLACEMENT CHART





TUBE FAILURE CHECK CHART

The following chart lists tubes whose failures are most likely to produce the indicated symptoms. Refer to tube placement chart for location and type of tube.

POWER SUPPLY FAILURE
No raster, no sound - **Selenium Rectifiers (M1 & M2)**

LOSS OF PICTURE OR SOUND
No pic, no sound, has raster - **V3, V4, V5, V6, V7 (V1 UHF only)**
No pic, no sound, has snow - **V2, V3, V4**
No pic, has sound, has raster - **V7, V8, V17**
Has pic, no sound - **V9, V10, V11**
Overloaded picture - **V8, V10**

SYNC FAILURE
No vert. sync - **V9, V12**
No horiz. sync - **V9, V13**
No vert. or horiz. sync - **V7, V9**

SWEEP FAILURE
No raster, has sound - **V13, V14, V15, V16, V17**
No vertical deflection - **V12**
Poor vert. linearity or foldover - **V12**
Poor horiz. linearity or foldover - **V13, V14, V15**
Narrow picture - **V13, V14, V15, V16, M1, M2**
Vert. off freq. - **V9, V12**
Horiz. off freq. - **V9, V13**

PROPERTY OF
L. F. BLANKENSHIP
3241 MEADE ST.
DENVER, COLORADO

TROUBLE SHOOTING AIDS

SWEEP

HORIZONTAL

LOSS OF SWEEP

Follow procedure outlined under "Loss of High Voltage".

INSUFFICIENT SWEEP

Check by substitution V14 and V15. Check M1 and M2. Check C100, C101, R98, R106, T3, T5A and other associated components.

DRIVE LINES

Check by substitution V14 and V15. Check C100, C101, R98, R106, T3, T5A and other associated components.

COMPRESSED LEFT SIDE

Check by substitution V14 and V15. Check horizontal output and damper stages for component failure or change of value.

FOLDS

Follow procedure outlined under "Drive Lines".

PIE CRUST EFFECT

Check by substitution V13, V14 and V15. Check C96, C97, and R85 for open. Check L44, C98 and other associated components.

XMAS TREE EFFECT

Check by substitution V13, V14 and V15. Check T3 and T5 for internal arcing. Check L44, C102, C103, C99, R92 and other associated components.

VERTICAL

LOSS OF SWEEP

Substitute V12. Check waveform W9.

If Satisfactory	If Unsatisfactory
Check T4, T5B, C2B, R79 and other associated components.	Check T2, C87, C88, C91, R77, R7 and other associated components.

INSUFFICIENT SWEEP

Substitute V12. Check height and vertical linearity controls for proper operation. Check R77, T4 and other associated components.

COMPRESSED AT BOTTOM

Substitute V12. Check R77, R5, C88, C91, T2 and other associated components.

COMPRESSED AT TOP

Substitute V12. Check R79, R6, C2B, T4, T5B and other associated components.

FOLDS

Substitute V12. Check C88, C91, T4, T5B and other associated components.

SYNC

LOSS OF VERTICAL AND HORIZONTAL SYNC

Check by substitution V7 and V9. Check C83, C84, R72, R73 and other associated components.

LOSS OF VERTICAL SYNC - HORIZONTAL SYNC SATISFACTORY

Substitute V12. Check vertical integrator network. Check C86, C87, T2, R5 and other associated components.

LOSS OF HORIZONTAL SYNC - VERTICAL SYNC SATISFACTORY

Substitute V13. Check C93, C94, C96, C97, R86, R4, L44 and other associated components.

HORIZONTAL BENDING

Check by substitution V7, V9 and V13. Check components associated with V13.

VIDEO

LOSS OF VIDEO

Substitute V7. Check L42, R49, C64, C68 and other associated components.

SOUND BARS(4.5MC BEAT)

Adjust tuner fine tuning for best sound and picture. Check adjustment A8. Check video IF alignment.

POOR CONTRAST

Substitute V7. Check C64, C68, R49, R48, L41 and other associated components.

NEGATIVE PICTURE

Substitute V7. Check picture tube. Check C64, C68, L41 and other associated components.

SMEAR

Substitute V7. Check video detector network. Check L38, L39, L41, C64, C68 and other associated components.

WIDE BLACK BAR ACROSS PICTURE

Check by substitution V2, V4, V5, V6 and V7 for heater to cathode leakage.

AUDIO

WEAK OR NO SOUND

Check by substitution V9, V10 and V11. Check stages V10 and V11 using audio signal generator. Apply audio signal across R1B.

If Satisfactory	If Unsatisfactory
Check ratio detector and audio IF stages for component failure or change of value.	Check C75, C78, C80, C81, C5, R65, R68, R103, T6, speaker and other associated components.

BUZZ

Adjust tuner fine tuning for best sound and picture. Check adjustment A11 for minimum buzz. If still unsatisfactory, check audio IF alignment.

DISTORTED

Follow procedure outlined under "Weak or no Sound".

POWER

DEAD SET

If filaments fail to light, check AC interlock assembly. Check switch on volume control and T1. If filaments light, check M1, M2 and C106. Check B+ filter and decoupling network.

SMALL AND/OR DIM PICTURE

Check M1, M2, and R106. Check B+ filter and decoupling network.

TROUBLE SHOOTING AIDS (cont)

PROPERTY OF
L. F. BLANKENSHIP
DENVER, COLORADO

HIGH VOLTAGE

LOSS OF HIGH VOLTAGE

Check by substitution V13, V14, V15 and V16. Check waveform W14.

If Satisfactory	If Unsatisfactory
Check T3, T5A, C7, C104 R98 and other associated components.	Check L44, R86, R92, R93, C95, C98, C99, C101, C103 and other associated components.

INSUFFICIENT HIGH VOLTAGE

Check by substitution V14 and V15. Check M1 and M2. Check R98, R106, C101, T3, T5A and other associated components.

BLOOMING

Check by substitution V14, V15, V16. Check R98, R106, C100, C101 and other associated components.

GENERAL

RASTER, SOUND, NO PICTURE

Follow procedure outlined under "Loss of Video".

RASTER, PICTURE NO SOUND

Follow procedure outlined under "Weak or no Sound".

RASTER, NO SOUND, NO PICTURE

Check by substitution V2, V3, V4, V5, V6, and V7. Check video IF components for failure or change of value. Raster, No Sound, No Picture, UHF, substitute V1.

NO RASTER, NO SOUND

Follow procedure outlined under "Dead Set".

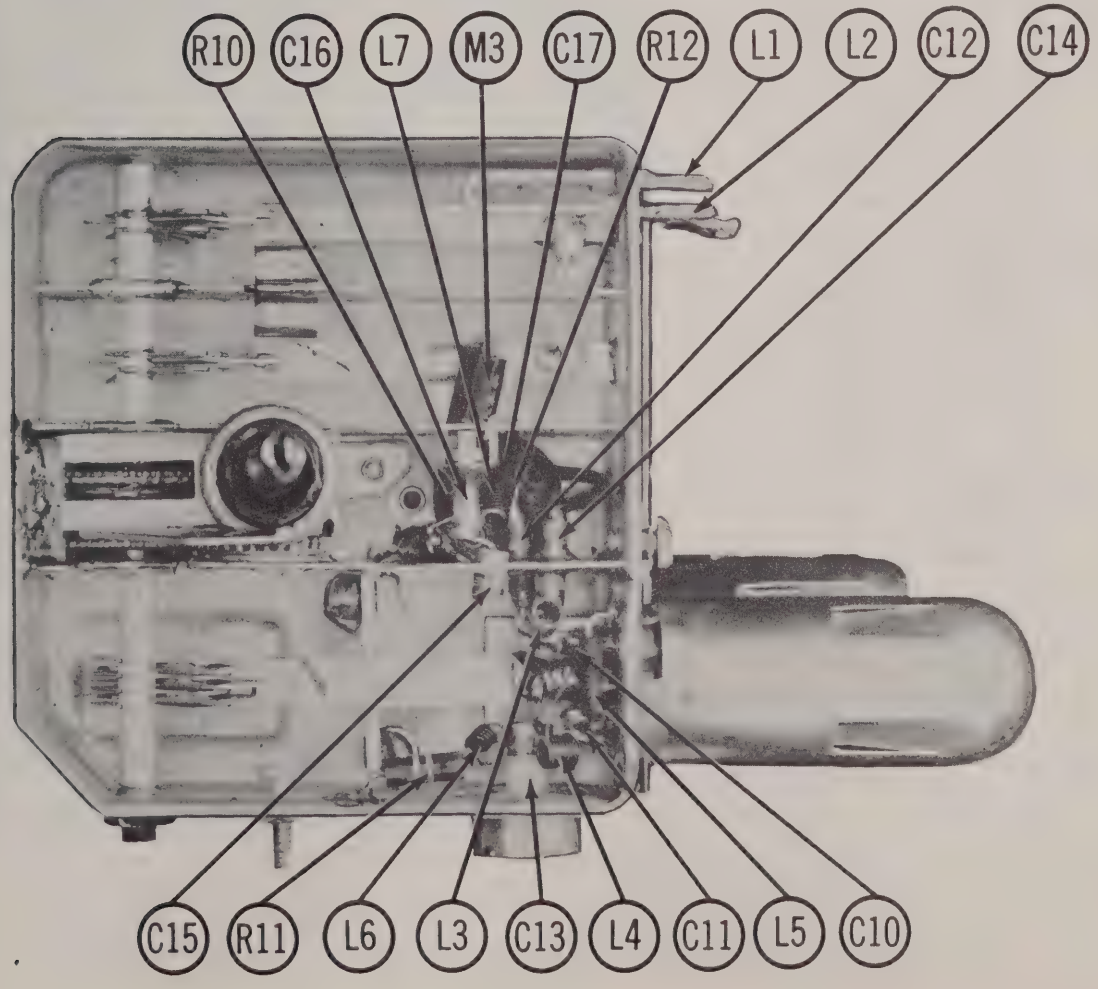
KEYSTONE EFFECT

Check T5 and its associated components.

INTERMITTENT STREAKS

Check high voltage section for corona discharge and arcing.

Symptoms shown are assumed and are not indicative of the quality and workmanship of this equipment.

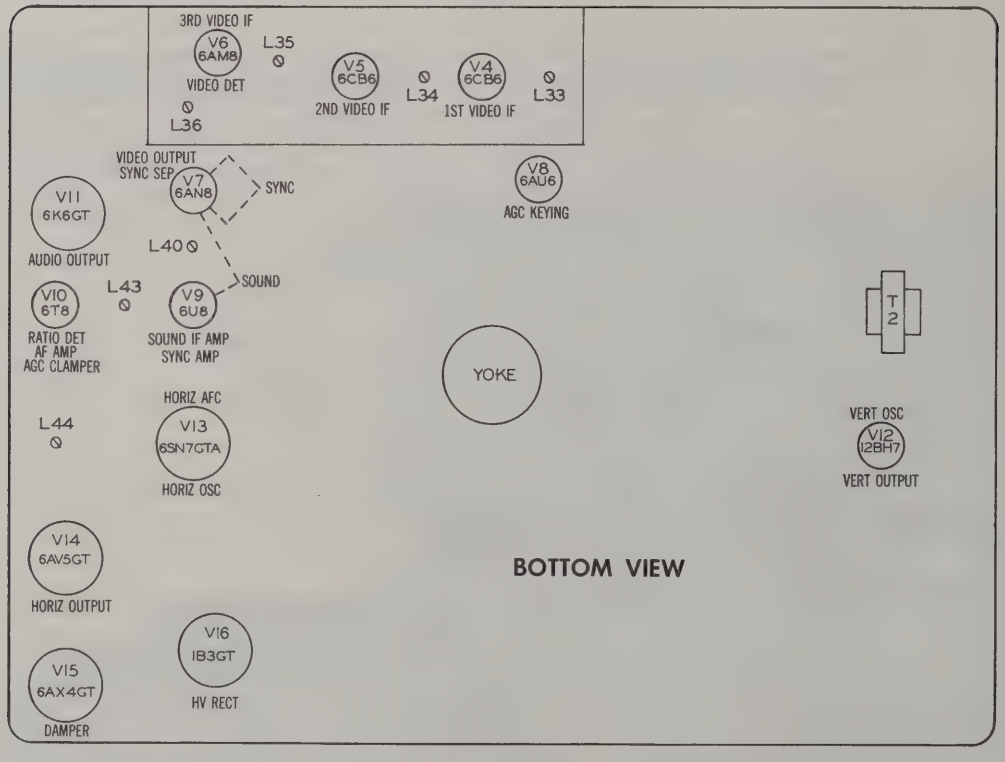


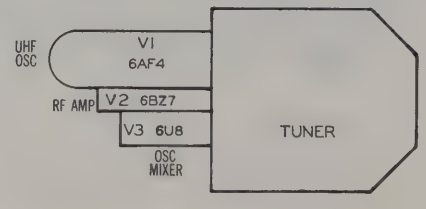
UHF TUNER FRONT VIEW

RESISTANCE MEASUREMENTS

Item	Tube	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8	Pin 9
V 1	6AF4	*†17KΩ	10KΩ	.1Ω	0Ω	0Ω	10KΩ	*†17KΩ		
V 2	6BZ7	†600Ω	440KΩ	Inf.	.1Ω	0Ω	Inf.	750KΩ	0Ω	0Ω
V 3	6U8	†12KΩ	480KΩ	†100KΩ	.1Ω	0Ω	†4.8KΩ	0Ω	0Ω	15KΩ
V 4	6CB6	45KΩ	39Ω	0Ω	.1Ω	†2.4KΩ	†2.4KΩ	0Ω		
V 5	6CB6	40KΩ	56Ω	0Ω	.1Ω	†2.4KΩ	†2.4KΩ	0Ω		
V 6	6AM8	220Ω	.1Ω	†8.3KΩ	.1Ω	0Ω	†8.3KΩ	.1Ω	4.7KΩ	0Ω
V 7	6AN8	†470KΩ	1.8Meg	0Ω	.1Ω	0Ω	†7.4KΩ	†2.3KΩ	1Meg	28Ω
V 8	6AU6	†22KΩ	†600Ω	†600Ω	†600Ω	500KΩ	▲22KΩ	†600Ω		
V 9	6U8	†6.3KΩ	5.3Ω	†4.5KΩ	.1Ω	0Ω	†4.5KΩ	560Ω	2.2KΩ	†470KΩ
V 10	6T8	Inf.	12KΩ	Inf.	0Ω	.1Ω	650KΩ	0Ω	4.7Meg	†270KΩ
V 11	6K6GT	NC	0Ω	†1.4KΩ	†1KΩ	470KΩ	TP	.1Ω	330Ω	
V 12	12BH7	▲1.7KΩ	2.2Meg	2.4KΩ	.1Ω	.1Ω	▲3.5Meg	1.6Meg	200Ω	0Ω
V 13	6SN7GTA	1Meg	†55KΩ	300KΩ	250KΩ	†40KΩ	0Ω	0Ω	.1Ω	
V 14	6AV5GT	470KΩ	0Ω	0Ω	NC	▲25Ω	NC	.1Ω	†8.8KΩ	
V 15	6AX4GT	NC	NC	70KΩ	NC	†140Ω	NC	.1Ω	0Ω	
V 16	1B3GT	1	PINS	1-8	HAVE	INF	RESISTANCE			TOP CAP ▲585Ω
V 17	21AVP4A	0Ω	4.7KΩ	PIN 6 ▲33Ω	PIN 10 ▲33Ω	PIN 11 †280KΩ	PIN 12 .1Ω			

* MEASURED IN "UHF" POSITION
† MEASURED FROM OUTPUT OF C1.
▲ MEASURED FROM PIN 3 OF V15
NC - NO CONNECTION
TP - TIE POINT





TUBE PLACEMENT CHART

ALIGNMENT INSTRUCTIONS

ALIGNMENT INSTRUCTIONS—READ CAREFULLY BEFORE ATTEMPTING ALIGNMENT

Use an isolation transformer to protect the test equipment.
The high voltage lead should be securely taped and kept away from chassis. Do not remove the horizontal oscillator tube (V13) to disable the high voltage.

VIDEO IF ALIGNMENT

Connect the negative lead of a 4.5volt bias supply to the ungrounded side of C6. Connect the positive lead to chassis.
Detune L33 and L34 by turning adjustments A2, A5, A6 and A7 maximum counter clockwise.

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	CHANNEL	CONNECT VTVM	ADJUST	REMARKS
1.	Direct	High side to an ungrounded tube shield floating over converter tube . Low side to chassis.	44.25MC (Unmod)	Any non-interfering channel	DC probe to point Ⓐ. Common to chassis.	A1	Attenuate generator output to maintain not more than -2.5 volts on VTVM. Adjust for maximum deflection.
2.	"	"	44.25MC	"	"	A2, A3	Detune L30 by turning A3 counter clockwise . Adjust A2 and A3 for maximum deflection.
3.	"	"	43.2MC	"	"	A4	Attenuate generator output to maintain not more than -2.5 volts at VTVM. Adjust for maximum deflection.
4.	"	"	45.3MC	"	"	A5	"
5.	"	"	47.25MC	"	"	A6	Increase generator output. Adjust for MINIMUM deflection.
6.	"	"	41.25MC	"	"	A7	"

OVERALL VIDEO IF RESPONSE CHECK

Attenuate sweep generator output to maintain 2 volts peak to peak on scope (~.3volts on VTVM at point Ⓐ). If a separate marker generator is used couple it loosely to sweep output cable near ungrounded converter tube.
Connect the synchronized sweep voltage from the sweep generator to the horizontal input of the oscilloscope for horizontal deflection.

	DUMMY ANTENNA	SWEEP GENERATOR COUPLING	SWEEP GENERATOR FREQUENCY	MARKER GENERATOR FREQUENCY	CHANNEL	CONNECT SCOPE	ADJUST	REMARKS
7.	Direct	High side to an ungrounded tube shield floating over converter tube. Low side to chassis.	44.25MC (10MC Swp.)	41.25MC 42.75MC 43.8MC 44.25MC 45.0MC 45.75MC 47.25MC	Any non-interfering channel	Vert. Amp. thru 10KΩ to point Ⓐ. Low side to chassis.		Check for response curve similar to Fig. 1. If necessary, retouch A1 thru A5 to obtain desired response. To view 41.25MC and 47.25MC traps increase generator output and use high scope gain. If necessary, retouch A6 and A7 to place 47.25MC and 41.25MC markers in center of trap notch as in Fig. 1.

SOUND IF ALIGNMENT USING AM SIGNAL GENERATOR AND VTVM

Connect two matched 100KΩ (±1%) resistors in series from point Ⓑ to chassis. The junction of these two resistors is alignment point Ⓓ as shown on the schematic.

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	CHANNEL	CONNECT VTVM	ADJUST	REMARKS
8.	.001MFD	High side to point Ⓔ. Low side to chassis.	4.5MC (Unmod)	Any non-interfering channel	DC probe to point Ⓑ. Common to chassis.	A8, A9, A10	Adjust for maximum deflection.
9.	"	"	"	"	DC probe to point Ⓒ. Common to point Ⓓ.	A-11	Adjust for zero reading. A positive and negative reading will be obtained on either side of the correct setting.

SOUND IF ALIGNMENT USING FM SIGNAL GENERATOR AND OSCILLOSCOPE

Use frequency modulated signal with 60∿ modulation and 450KC sweep. Use 120∿ sawtooth voltage in scope for horizontal deflection.

	DUMMY ANTENNA	SWEEP GENERATOR COUPLING	SWEEP GENERATOR FREQUENCY	MARKER GENERATOR FREQUENCY	CHANNEL	CONNECT SCOPE	ADJUST	REMARKS
8.	.001MFD	High side to point Ⓔ. Low side to chassis.	4.5MC (450KC Swp.)	4.5MC	Any non-interfering channel.	Vert. Amp. to point Ⓑ. Low side to chassis.	A8, A9, A10	Disconnect stabilizing capacitor C4. Adjust for curve of maximum amplitude and symmetry similar to Fig. 2.
9.	"	"	"	"	"	Vert. Amp. to point Ⓒ. Low side to chassis.	A11	Reconnect stabilizing capacitor C4. Adjust so that 4.5MC occurs at center of cross-over lines as in Fig. 3. Slightly retouch A10 for maximum amplitude and straightness of crossover lines.

VHF TUNER ALIGNMENT

This portion of the receiver has been properly aligned at the factory and is very stable. Alignment of this portion should not be required in the field.

UHF TUNER ALIGNMENT

This portion of the receiver has been properly aligned at the factory and is very stable. Alignment of this portion is not recommended in the field.

4.5MC TRAP ALIGNMENT

Tune in a local TV station and inspect the picture for evidence of 4.5MC beat interference. If necessary, adjust A8 until the horizontal scanning lines are smooth and continuous.

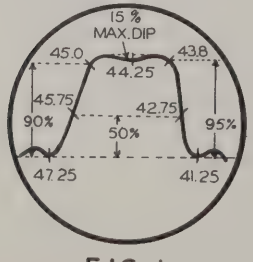


FIG. 1

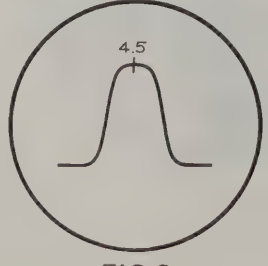


FIG. 2

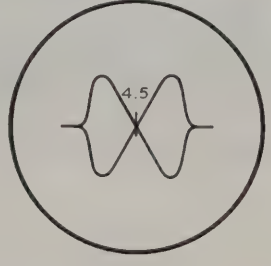
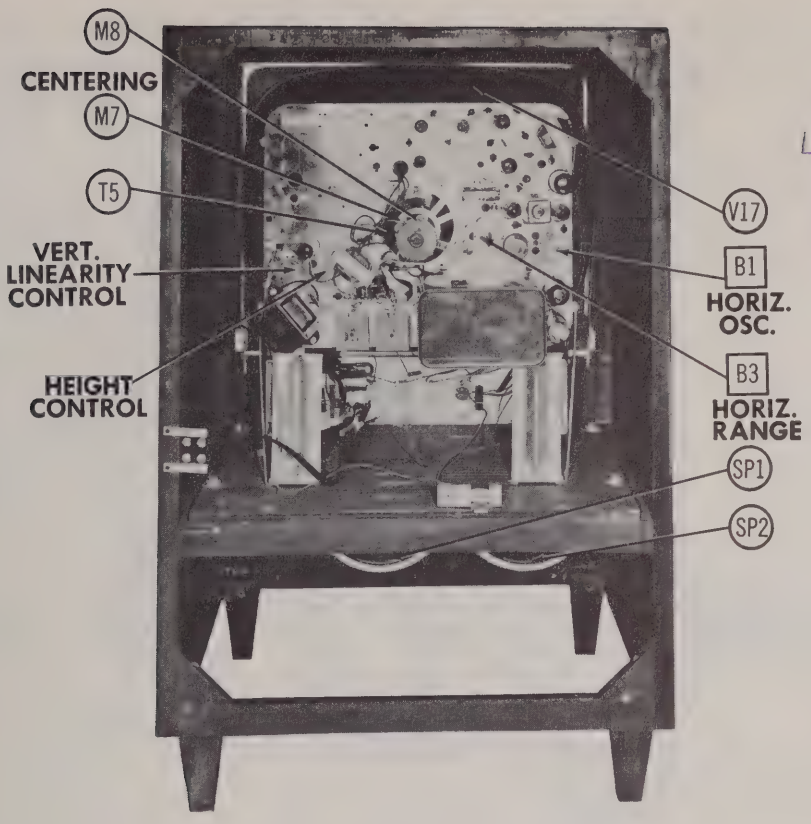


FIG. 3



PROPERTY OF
L. F. BLANKENSHIP
3004 MEADE ST.
DENVER, COLORADO

CABINET—REAR VIEW

HORIZONTAL SWEEP CIRCUIT ADJUSTMENTS

Turn the set on and tune in a TV station, preferably a test pattern.

HORIZONTAL FREQUENCY ADJUSTMENT

1. Turn the horizontal range trimmer (B3) maximum clockwise.

2. If the picture cannot be synchronized with the horizontal hold control, set the control to its mid-range position and adjust the horizontal frequency slug (B1) until the picture is in sync. If the picture will not synchronize, turn the horizontal waveform slug (B2) several turns counter clockwise and readjust B1 until the picture synchronizes.

HORIZONTAL WAVEFORM ADJUSTMENT

Connect the vertical amplifier of an oscilloscope thru a low capacity probe (Fig. 5) to terminal "C" of L44. If necessary, adjust B2 for waveform similar to Fig. 4 with broad and narrow peaks of equal height. Keep the picture in sync while making this adjustment with the horizontal hold control or B1. Remove scope.

HORIZONTAL RANGE TRIMMER ADJUSTMENT

1. Turn the horizontal hold control maximum counter clockwise. Switch off channel and back again. If the picture does not lose sync, turn B1 counter clockwise until picture loses sync when switching off channel and back again. Adjust B1 clockwise, until picture just pulls into sync.

2. Turn horizontal hold control maximum clockwise. Switch off channel and back again. If the picture does not pull into sync, turn the horizontal range trimmer (B3) clockwise until the picture pulls into sync.

3. Due to reaction between B1 and B3 it may be necessary to repeat steps 1 and 2 several times before proper synchronization is obtained. When properly adjusted, the picture should remain in sync at both extreme settings of the horizontal hold control when switching off channel and back again.

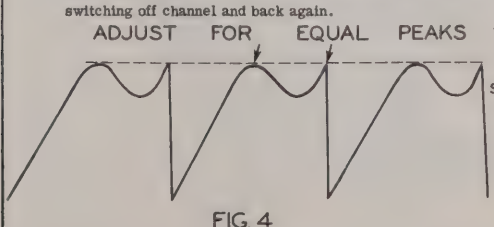


FIG. 4

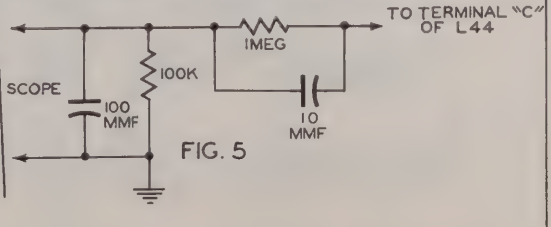
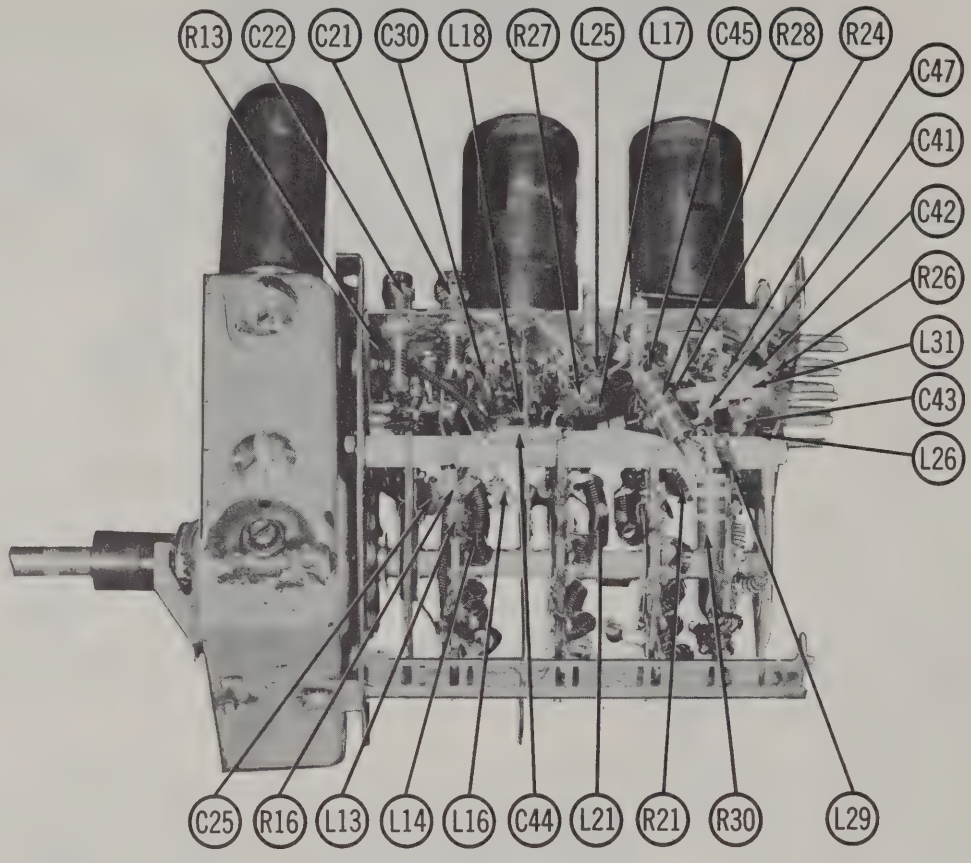
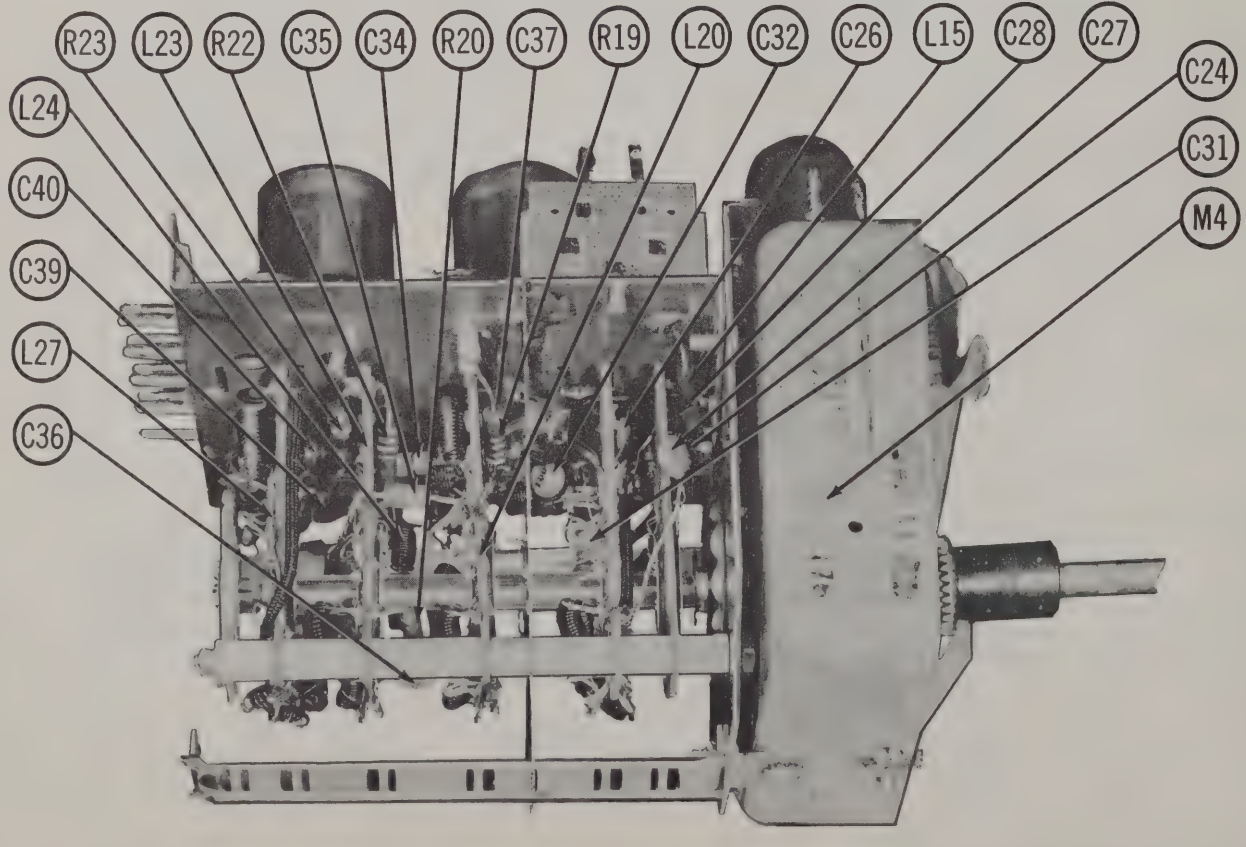


FIG. 5



UHF-VHF TUNER-RIGHT SIDE



UHF-VHF TUNER-LEFT SIDE

PARTS LIST AND DESCRIPTIONS

TUBES (SYLVANIA, GENERAL ELECTRIC, WESTINGHOUSE)

ITEM No.	USE	REPLACEMENT DATA		RETMA BASE TYPE	NOTES
		SILVERTONE PART No.	STANDARD REPLACEMENT		
V1	UHF Osc.	6AF4	6AF4	7DK	
V2	RF Amp.	6BZ7	6BZ7	9AJ	
V3	VHF Mixer-Osc.	6U8	6U8	9AE	
V4	1st Video IF Amp.	6CB6	6CB6	7CM	
V5	2nd Video IF Amp.	6CB6	6CB6	7CM	
V6	3rd Video IF Amp.-Video Det.	6AM8	6AM8	9CY	
V7	Video Output-Sync Sep	6AN8	6AN8	9DA	
V8	AGC Keying	6AU6	6AU6	7BK	
V9	Sound IF Amp. - Sync Amp.	6U8	6U8	9AE	
V10	Ratio Det. - AGC Clamper-AF Amp.	6T8	6T8	9E	
V11	Audio Output	6K6GT	6K6GT	7S	
V12	Vert. Osc. - Vert. Output	12BH7	12BH7	9A	
V13	Horiz AFC-Horiz. Osc.	6SN7GTA	6SN7GTA	8BD	
V14	Horiz. Output	6AV5GT	6AV5GT	6CK	
V15	Damper	6AX4GT	6AX4GT	4CG	
V16	HV Rect.	1B3GT	1B3GT	3C	

CATHODE-RAY TUBE

ITEM No.	REPLACEMENT DATA					RETMA BASE TYPE	NOTES
	SILVERTONE PART No.	CBS PART No.	GENERAL ELECTRIC PART No.	SYLVANIA PART No.	WESTINGHOUSE PART No.		
V17	21AVP4A ①	21AVP4A ①		21AVP4A② 21AVP4	21AVP4A①	12L 12L	① Aluminized ② Silver Screen

CAPACITORS

Capacity values given in the rating column are in mfd. for Electrolytic and Paper Capacitors, and in mmfd. for Mica and Ceramic Capacitors.

ITEM No.	RATING		REPLACEMENT DATA						NOTES
	CAP.	VOLT	SILVERTONE PART No.	CENTRALAB PART No.	ERIE PART No.	MALLORY PART No.	PYRAMID PART No.	SANGAMO PART No.	
C1	150	150	T18-323			FP117	TM-150-150	S-105	
C2A	■150	150	T18-322			FP117	TM-150-150	S-105	
B	▲50	50				TC39	TD-50-50	FM-0550	
C3A	▲200	300	T18-330				TM-4121	T-140	
B	20	300						T-115	
C	■20	300							
D	▲20	300							
C4	4	50	T18-292			TC30	TD-4-50	MMT-0505	
C5	50	25	T18-335			TC29	TD-50-25	FM-0250	
C6	2	50	T18-332			TC302	TD-2-50	MMT-0505	Note 1
C7	10	300	T18-325			TC62	TD-12-350	FM-3512	
C8	500		T15-304	DD-501	831-471	UC-535			
C9	500		T15-304	DD-501	831-471				
C10	170								
C11	170								
C12	1000			MFT-1000					
C13	1-4			829-4	3115-01-10	CT551			
C14	1000			MFT-1000					
C15	1.1			TCZ-1	NP0A-010				
C16	3.3								
C17	1000			DD-102	801-001	DC-521			
C18	500		T15-304	DD-501	831-471	UC-535			
C19	500		T15-304	DD-501	831-471	UC-535			
C20	150			DD-151	GP2K-151	UC-5315			
C21	5-10								
C22	5-10								
C23	15								
C24	18			TCZ-18	NP0K-180				
C25	15			DD-150	GP1K-150	UC-5415			
C26	6.8			TCZ-6R8	NP0A-6R8	ZT-5568			
C27	1000			DD-102	801-001	DC-521			
C28	6.8			TCZ-6R8	NP0A-6R8	ZT-5568			
C29	1000			MFT-1000					
C30	4								
C31	2.7								
C32	1000			DD-102	801-001	DC-521			
C33	1000			MFT-1000					
C34	.3								
C35	.56								
C36	.91								
C37	1000			DD-102	801-001	DC-521			
C38	1000			MFT-1000					
C39	15			DD-150	GP1K-150	UC-5415			
C40	1.2								
C41	1.5			TCZ-1R5	NP0A-1R5	ZT-5515			
C42	10								
C43	10								
C44	1000			MFT-1000					
C45	1000			DD-102	801-001	DC-521			
C46	1000			MFT-1000					
C47	1000			DD-102	801-001	DC-521			
C48	5								
C49	62								
C50	1000			MFT-1000					
C51	1000		T15-247	DD-102	801-001	DC-521			
C52	2.0	200	T16-267				MT2-2		
C53	47		T15-317	D6-470	831-470	UC-5447		K-1447	
C54	100		T15-292	DD-101	801-101	UC-531		K-1310	
C55A	1000		T15-286	DD2-102	812-001	DCD-521		K-1210	
B	1000							K-1210	
C56	1000		T15-220	DD-102	801-001	DC-521		K-1210	
C57	560		T15-303	DD-561	811-561	UC-5356		K-1356	
C58	1000		T15-247	DD-102	801-001	DC-521		K-1210	
C59A	1000		T15-286	DD2-102	812-001	DCD-521		K-1210	
B	1000							K-1210	

PROPERTY OF
L. F. BLANKENSHIP
3924 MEADE ST.
DENVER, COLORADO

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PARTS LIST AND DESCRIPTIONS (Continued)

CAPACITORS (cont)

ITEM No.	RATING CAP.	RATING VOLT	SILVERTONE PART No.	CENTRALAB PART No.	ERIE PART No.	MALLORY PART No.	PYRAMID PART No.	SANGAMO PART No.	NOTES
			REPLACEMENT DATA						
C80	1000		T15-247	DD-102	801-001	DC-531		K-1310	
C81	680		T15-390	DD-681	812-681	UC-5368		K-1356	
C82A	1000		T15-398	DD3-102	813-001	DCD-531		K-1310	
B	1000							K-1310	
C83	10		T16-251	DD-100	831-100	UC-541		K-1305	
C84	5000		T16-177	DD-502	841-005	DC-535	IMPE-D5	C-1350	
C85	150		T15-396	DD-151	811-151	UC-5316		K-1315	
C86	33								
C87	33								
C88	.047	400	T16-247	DF-503		PT4167	IMP4-647	3304147	
C89	.033	400	T16-248	DF-303	817-02	PT4125	IMP4-633	3304123	
C90	27	4000	T15-315	DD30-270				K-5437	Note 2
C91A	5000		T16-264	DD3-502	811-005	DC-535		C-1350	
B	5000				811-005	DC-535		C-1350	
C92	5		T15-222	TCE-5R1	NPOA-050	ST-555		K-1356	
C93	680		T15-303	DD-561	812-561	UC-5366		K-1356	
C94	2000		T15-228	DD-202	801-002	DC-533	IMP6-D8	C-1330	
C95	5000		T16-177	DD-502	841-005	DC-535	IMP6-D5	C-1350	
C96	.047	400	T16-247	DF-303		PT4167	IMP4-647	3304147	
C97	5000		T16-177	DD-502	841-005	DC-535	IMP6-D5	C-1350	
C98	5000		T16-177	DD-502	841-005	DC-535	IMP6-D5	C-1350	
C99	5000		T16-177	DD-502	841-005	DC-535	IMP6-D5	C-1350	
C81	5000		T16-177	DD-502	841-005	DC-535	IMP6-D5	C-1350	Note 3
C82	.047	600	T16-247	DF-503		PT6167	IMP4-647	3306147	
C83	.033	400	T16-248	DF-303	817-02	PT4125	IMP4-633	3304123	
C84	150		T15-295	DD-151	811-151	UC-5315		K-1315	
C85A	2000					DC-533	IMP6-D8	C-1330	
B	5000		*T17-409	4PC-104	41405-01	DC-535	IMP6-D5	C-1350	
C	5000					DC-535	IMP6-D5	C-1350	
C86	.0047	600	T16-233	D6-472	GP3-333-472	IMP6-D47		3306347	
C87	5000		T16-177	DD-502	841-005	DC-535	IMP6-D5	C-1350	
C88	.47	600	T16-249			PT6047		3306047	
C89	.047	400	T16-245	DF-503		PT4167	IMP4-647	3304147	
C90	.1	400	T15-254	DF-104		PT401	IMP4-P1	33401	
C91	.047	400	T16-247	DF-503		PT4167	IMP4-647	3304147	
C92	.047	200	T16-258	DF-503		PT4167	IMP3-647	3302147	
C93	180	500	T15-300	D6-181	GPSE-181	MC5317		K-1318	
C94	2000		T15-228	DD-202	801-002	DC-533	IMP6-D8	C-1330	
C95	.047	400	T16-245	DF-503		PT4167	IMP4-647	3304147	
C96	.033	200	T16-263	DF-303	817-03	PT4123	IMP4-633	3304123	
C97	.22	300	T16-253			PT4023	IMP3-P22	3303023	
C98	390	500	T15-275	D6-391	811-391	MC5243		K-1339	
C99	.01	600	T16-262	D6-103	GP3-333-103	PT611	IMP6-81	33061	
C100	1000	500	T15-288		811-102	MC5356		K-1310	
C101	.0047	600	T16-233	D6-472	GP3-333-472	PT6147	IMP6-D47	3306347	
C102	47	500	T15-299	D6-470	831-470	MC5223		K-1447	
C103	100		T15-292	TCW-100	N750L-101	NT-531		K-1310	
C104	.047	400	T16-245	DF-503		PT4167	IMP4-647	3304147	
C105	56	3000		DD30-560	3KV-560	DC30456			
C106	.047	600	T16-247	DF-503		PT6147	IMP6-647	3306147	
C107	270			DD-271	811-271	UC-5327		K-1327	Note 4

Note 1. Chassis 528.33501, 528.34300 and 528.34301 use 4MFD in this application (part #T18-292).
Note 2. Chassis 528.33501 and 528.34301 use 82MMF in this application (part #T15-287).
Note 3. Some versions use 2000MMF in this application (part #T15-228).
Note 4. Used in chassis 528.33501 and 528.34301 only.
* Items C85A, C85B, C85C, R76A, R76B and R76C are combined in one unit.

CONTROLS

ITEM No.	RATING RESISTANCE	RATING WATTS	SILVERTONE PART No.	IRC PART No.	CLAROSTAT PART No.	CENTRALAB PART No.	MALLORY PART No.	INSTALLATION NOTES
			REPLACEMENT DATA					
R1A	300Ω	½	T24-232	QJ-771A	RTV-462	FI-0	UF52L	Contrast (Panel)
B	2.5Meg	½				R2-52	UR16A	Volume (Rear) Attach to R1A
C	Switch					KS-1	US-28	Attach to R1B
R2A	100KΩ	½	T35-49		A47-100K-S		U-41	Brightness See Note #1
B	Shaft		Not Req.		KS8-3		Not Req.	Attach to R2A
C	Switch		Not Req.		SWE-21		US-25	Phono-Attach to R2A
R3	100KΩ	½	T35-54					Brightness & Switch See Note #2
R3A	50KΩ	½	T35-43	Q11-123	A47-50K-S	AB-31	U-35	Tone
B	Shaft		Not Req.	Not Req.	KS8-3		AK-4	Attach to R3A
R4A	50KΩ	½	T35-42	Q11-125	A47-50K-S	AB-31	U-35	Horiz. Hold
B	Shaft		Not Req.	Not Req.	KS8-3		Not Req.	Attach to R4A
R5A	2.5Meg	½	T35-50	†Q11-131	†A47-1Meg-S		†U-54	Vertical-Hold (Stop at 1.5Meg)
B	Shaft		Not Req.	Not Req.	KS8-3		AK-4	Attach to R5A
R6A	250KΩ	½	T35-45	Q11-123	A47-250K-S	AB-31	AU-7	Vertical Linearity
B	Shaft		Not Req.	RQ	FK8-1/4		AK-1	Attach to R6A
R7A	5Meg	½	T35-43	†Q11-141	†A47-4Meg-S		†AB-86	Height(Stop at 4Meg)
B	Shaft		Not Req.	RQ	FK8-1/4		AK-1	Attach to R7A

Note 1. This control used in some versions of chassis 528.33500, and 528.34300.
Note 2. This control used in chassis 528.34301, 528.33501, and some versions of 528.33500, and 528.34300.
†Connect a 1Meg resistor in series with the right hand terminal of the control and the lead connecting to the same terminal of the original control (control viewed from shaft end terminals down).
▲ CONCENTRIKIT EQUIVALENT: K-2 KIT, BASE ELEMENTS & SHAFTS: B11-102, P1-104 (Panel)
B13-157, R9-302 (Rear)
76-1 SWITCH

RESISTORS

ITEM No.	RATING OHMS	RATING WATT	SILVERTONE PART No.	IRC PART No.	NOTES
			REPLACEMENT DATA		
R8	470KΩ	½	S804740K	BTS-470K	
R9	470KΩ	½	S804740K	BTS-470K	
R10	330Ω	½			
R11	10KΩ	½			
R12	1000Ω	½			
R13	5.6Ω	½			
R14	470KΩ	½	S804740K	BTS-470K	
R15	470KΩ	½	S804740K	BTS-470K	
R16	100KΩ	½			
R17	1Meg 5%	½			
R18	750Ω 5%	½			
R19	470Ω	½		BTS-470	
R20	10KΩ	½			
R21	330Ω	½			
R22	470KΩ	½			
R23	10KΩ	½			
R24	100KΩ	½			
R25	470Ω	½			
R26	15KΩ	½			
R27	150KΩ	½			
R28	330Ω	1			
R29	100Ω	½			
R30	330Ω	1			
R31	10KΩ	2	S801032K	BTB-10K	Note 4
R32	5600Ω	½	S805620K		
R33	1000Ω	½	S801020K		
R34	220KΩ	½	S802240K		
R35	39Ω	½	S803900K	BTS-39	
R36	150Ω	½	S801S03K	BTS-150	
R37	18KΩ	½	S801803K	BTS-150	
R38	100Ω	½	S801030K		
R39	39KΩ	½	S803930K		
R40	56Ω	½	S805600K	BTS-56	
R41	10KΩ	½	S801S03K	BTS-150	
R42	47KΩ	½	S804730K		
R43	220Ω	½	S802210K	BTS-220	
R44	5600Ω	½	S805620K		
R45	8200Ω	3	S808222K		
R46	4700Ω	2	S804720K		
R47	1Meg	½	S801050K		
R48	560Ω	½	S805610K	BTS-560	
R49	8200Ω	3	S808222K		
R50	270KΩ	½	S802740K		
R51	47KΩ	½	S804730K		
R52	39KΩ	½	S803930K		
R53	390KΩ	½	S803940K		Note 3
R54	100KΩ	½	S801040K		
R55	39KΩ	½	S803930K		
R56	22KΩ	2	S802232K		
R57	220KΩ	2	S802242K		Note 2
R58	470KΩ	½	S804740K		
R59	560Ω	½	S805610K	BTS-560	

ITEM No.	RATING OHMS	RATING WATT	SILVERTONE PART No.	IRC PART No.	NOTES
			REPLACEMENT DATA		
R60	2200Ω	½	S802220K	BTS-2200	
R61	33Ω	½	S803310K	BTS-330	
R62	22KΩ	½	S802330K	BTS-22K	
R63	12KΩ	½	S801230K	BTS-12K	
R64	4.7Meg	½	S804750K	BTS-4.7Meg	
R65	270KΩ	½	S802740K	BTS-270K	
R66	3.6Meg	½	S803650J	BTS-3.6Meg 5%	Note 1
R67	470KΩ	½	S804740K	BTS-470K	
R68	33Ω	½	S803310K	BTA-330	
R69	15KΩ	½			
R70	1.5Meg	½	S801550K		
R71	270KΩ	½	S802740K		
R72	470KΩ	½	S804740K		
R73	3300Ω	½	S803330K		
R74	1800Ω	½	S801820K		
R75	2200Ω	½	S802230K		
R76A	22KΩ	½			
B	8200Ω	½	▲T17-109		
C	5300Ω	½			
R77	1Meg	½	S801050K		
R78	2.2Meg	½	S802250K		
R79	150KΩ	½	S801520K		
R80	470KΩ	½	S804730K		
R81	470KΩ	½	S804730K		
R82	56KΩ	½			
R83	56Ω	½			
R84	330KΩ	½	S803240K		
R85	8200Ω	½	S808220K		
R86	68KΩ	½	S806831K		
R87	120KΩ	½	S801341K		
R88	2.7Meg	½	S802751K		
R89	150KΩ	½	S801541K		
R90	100KΩ	½	S801041K		
R91	150KΩ	½	S801541K		
R92	8200Ω	½	S808222K		
R93	39KΩ	½	S803931K		
R94	10KΩ	½	S801032K		
R95	100KΩ	½	S801041K		
R96	150KΩ	½	S801541K		
R97	470KΩ	½	S804740K		
R98	8200Ω	2	S808222K		
R99	100Ω	½			
R100	2.2Ω	½	T60-972		
R101	470Ω	1	S804471K	BTA-470	
R102	140Ω	10	T61-2		
R103	100Ω	3	S801023K	BTB-1000	
R104	2300Ω	15	T61-3		
R105	900Ω	10	T61-4		
R106	7.5Ω	5	S451007		
R107	470KΩ	½	S804740K	BTS-470K	
R108	82K	½	S808230K		Note 5

* Items R76A, R76B, R76C, C85A, C85B, & C85C are combined in one unit.
Note 1. Some versions use a 4.3Meg resistor in this application.
Note 2. Some versions use a 47KΩ 1 Watt resistor in this application.
Note 3. Some versions use a 680K resistor in this application.
Note 4. Chassis 528.34301, 528.33501 use a 68000 2 Watt resistor in this application.
Note 5. Used in chassis 528.33501 only.

TRANSFORMER (FILAMENT)

ITEM No	RATING PRI.	RATING SEC. 1	RATING SEC. 2	SILVERTONE PART No	Halldorson PART No	Merit PART No	RCA TYPE No	Stancor PART No	Thordarson PART No	Triad PART No
				REPLACEMENT DATA						
T1	117VAC	6.3VAC ② .54A	6.3VAC ③ 3A	80-318						

TRANSFORMERS (SWEEP CIRCUITS)

ITEM No.	USE	SILVERTONE PART No.	Halldorson PART No	Merit PART No	RCA TYPE No	Ram PART No	Stancor PART No	Thordarson PART No	Triad PART No
		REPLACEMENT DATA							
T2	Vert. Osc. Trans.	T90-317	B6702X ①	A-3003X ①	209T1 ①	V405 ①	A-8125 ①	26A03 ①	A-97X ①
T3	Horiz. Output Trans.	T90-329	FB41 ✱①	HVO-9 ✱ ①	230T1 ✱ ①	X080 ✱①	A-8285 ✱ ①	FLY-24 ✱ ①	D-19 ✱①
T4	Vert. Output Trans.	T90-318	Z1806 ①	A-3039X ①	226T1 ①	V312 ①	A-8141 ①	26S54 ①	A-104X ①
T5A	Yoke-Horiz. (24MH)	T10-898 ②	DF805 ③④	MDF-75 ③④	232D1 ②	Y70F25 ③	DY-15A ②	Y-10 ② ③	Y-19-1 ③
B	Vert. (37MH)				③ ④	④	③		④

① Drill new mounting hole(s).
② Includes capacitor C105, resistors R82, R83 and R98.
③ Use original rear cover and centering device.
④ Connect horizontal damping network across terminals #3 and #7. Use original if necessary.
⑤ Use original horizontal damping network if necessary.

*HORIZONTAL OUTPUT TRANSFORMER CONNECTION DATA

Use Original Width Coil Unless Replacement Type Is Listed

ORIGINAL TERMINAL CONNECTIONS	Halldorson Replacement Connections	Merit Replacement Connections	RCA Replacement Connections	Ram Replacement Connections	Stancor Replacement Connections	Thordarson Replacement Connections	Triad Replacement Connections
4	9	9	9	9	9	9	9
3	8	8	8	7 & 8	8	8	8 & 7
2	3	3	3	3	3	3	3
1	1	1	1	1	1	1	1

TRANSFORMER (AUDIO OUTPUT)

ITEM No	IMPEDANCE	SILVERTONE PART No	Halldorson PART No	Merit PART No	Stancor PART No	Thordarson PART No	Triad PART No	NOTES
		REPLACEMENT DATA						
T6	5KΩ	80-329	Z1002	A-3019	A-3849	25849	S-52	

SPEAKER

ITEM No.	RATINGS SIZE	RATINGS FIELD	RATINGS V C IMP.	SILVERTONE PART No	QUAM PART No	NOTES
				REPLACEMENT DATA		
SP1	8"	PM	6Ω	79-443	8A8	
SP2	8"	PM	8Ω	79-443	8A8	

COILS (RF-IF)

ITEM No.	USE	DC RES. PRI.	DC RES. SEC.	SILVERTONE PART No.	MEISSNER PART No	MERIT PART No	MILLER PART No	NOTES
				REPLACEMENT DATA				
L1	UHF antenna coil	0Ω						
L2	UHF antenna coil	0Ω						
L3	Fil. choke	0Ω						
L4	Fil. choke	0Ω						
L5	Cathode choke	0Ω						
L6	RF choke	0Ω						
L7	UHF fil coil	0Ω						
L8	VHF antenna matching trans.	.5Ω	.5Ω					
L9	VHF antenna matching trans	.5Ω	.5Ω	S808242K				
L10	IF trap	.2Ω		S808232K				
L11	FM trap			S802751K				
L12	IF trap	.3Ω		S801541K				
L13	VHF antenna coil	0Ω		S810041K				
L14	UHF coil	0Ω						
L15	UHF IF coil	1.5Ω		S808242K				
L16	VHF antenna coil	0Ω		S808232K				
L17	Fil. choke	0Ω		S806243K				
L18	Neut. coil	0Ω		S806231K				
L19	VHF RF coil	0Ω		S806241K				Channel 13
L20	VHF RF coils	0Ω		S806251K				
L21	UHF IF coil	0Ω		S806261K				
L22	VHF mixer Grid coil	0Ω		S806271K				Channel 13
L23	VHF mixer grid coils	0Ω		S806281K				
L24	UHF IF coil	0Ω		S806291K				
L25	Fil. choke	0Ω		S806301K				
L26	VHF Osc. coil	0Ω		S806311K				Channel 13
L27	VHF Osc. coils	0Ω		S806321K				
L28	VHF Osc. coil	0Ω		S806331K				Channel 6
L29	UHF IF coil	1.6Ω		S806341K				
L30	UHF IF coil	0Ω		S806351K				
L31	RF coil	0Ω		S806361K				
L32	Conv. Plate	0Ω		S806371K				
L33	1st Video IF	.1Ω		T10-680	17-5002*	TV-137*	6232*	Includes 41.25MC trap.
L34	2nd Video IF	.1Ω	.3Ω	T10-677	17-4520*	TV-136	6233	Includes 47.25MC trap.
L35	3rd Video IF	.1Ω		T10-678	17-5000	TV-135	6234	
L36	4th Video IF	.1Ω	.3Ω	T10-679	17-5004	TV-135	6234	
L37	RF coil	.1Ω		T10-697	19-1000		4602	1.2 Microhenries
L38	Series Peaking coil	4.6Ω		T10-676	19-3125		6153	120 Microhenries
L39	Shunt Peaking Coil	1Ω		T10-690	19-3250	TV-185	6130	269 Microhenries
L40A	4.5MC trap	5.3Ω						
B	Sound IF	5.3Ω		T10-674				
L41	Series peaking coil	10Ω		T10-671	19-4250	TV-185▲	6173	220 Microhenries, wound on 22KΩ resistor
L42	Shunt peaking coil	1Ω		T10-690	19-3250	TV-185	6130	269 Microhenries
L43	Ratio Det.	3.7Ω	.3Ω CT	T10-552	17-1033+	TV-110+	1468+	Tertiary Winding=.8Ω
L44	Horiz. Osc.	20Ω	50Ω	T10-669	20-1402	TV-162	6163	Waveform Winding=46Ω

* Use one winding only.
✱Cut out chassis hole & drill mounting holes.
▲ Parallel with 22KΩ resistor.
✱Drill mounting holes & disconnect cap. across primary winding.

SELENIUM RECTIFIER

ITEM No.	RATING CURRENT	SILVERTONE PART No	FEDERAL PART No	MALLORY PART No	RADIO RECEPTOR PART No	SARKES TARZIAN PART No	NOTES
		REPLACEMENT DATA					
M1	.240ADC	83-829	1090A	MR-300	6S300	6Q4	300
M2	.240ADC	83-829	1090A	MR-300	6S300	6Q4	300

CRYSTAL DIODES

ITEM No.	ORIG. TYPE	SILVERTONE PART No.	SYLVANIA PART No	NOTES
		REPLACEMENT DATA		
M3	ST47*		1N82 or 1N82A	UHF Mixer-Chassis 528.33500, 528.33400, 528.33501,

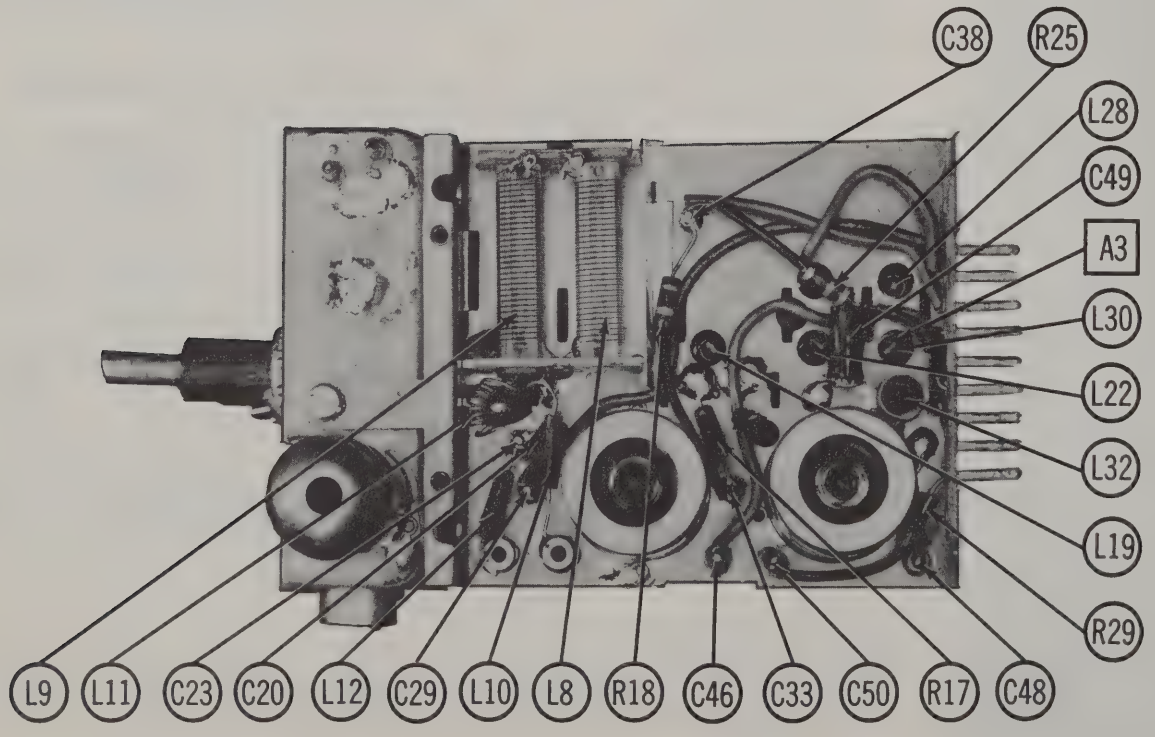
* Some versions may use 1N82A type crystal diode (Silvertone Part No. T84-99).

SILVERTONE MODELS 5132A, B, 5133A, B, 5134, 5135, 5136, 5137 (Ch. 528.33400, 528.33500, 528.33501, 528.34300, 528.34301, 528.34400)

PARTS LIST AND DESCRIPTIONS (Continued)

MISCELLANEOUS

ITEM No.	PART NAME	SILVERTONE PART No.	NOTES
M4	Dial Light	T89-7	#47
M5	Tuner	T95-45	VHF-Chassis 528.33500, 528.33400, 528.3350L
	Tuner	T95-47	VHF-Chassis 528.34300, 528.34400, 528.3430L
M6	Tuner	T95-46	UHF-Chassis 528.33500, 528.33400, 528.3350L
			VHF-UHF Combination Tuner. Part #T95-44 may replace individual VHF & UHF tuners in chassis 528.33500, 528.33400, 528.3350L
M7	Centering device		Part of yoke back cover (T5).
M8	Ion Trap	T83-830	
B3	Trimmer Cap.	T20-152	Horiz. Range (25-280MMF).
	Cabinet	T42-723	Models 5133A, 5132A
	Cabinet	T42-711	Models 5133B, 5132B
	Cabinet	T42-718	Models 5135, 5134
	Cabinet	T42-717	Models 5137, 5136
	Knob	T52-530	VHF Channel Selector-Models 5132A, 5132B, 5134.
	Knob	T52-551	VHF Channel Selector-Model 5136
	Knob	T52-531	VHF Channel Selector-Models 5133A, 5133B, 5135
	Knob	T52-564	VHF Channel Selector-Model 5137
	Knob	T52-529	VHF Fine Tuning-Models 5132A, 5132B, 5134
	Knob	T52-548	VHF Fine Tuning-Model 5136
	Knob	T52-534	VHF Fine Tuning-Models 5133A, 5133B, 5135
	Knob	T52-566	VHF Fine Tuning-Model 5137
	Knob	T52-532	UHF Channel Selector-Models 5133A, 5133B, 5135
	Knob	T52-565	UHF Channel Selector-Model 5137
	Knob	T52-545	On-Off-Volume-Models 5132A, 5132B, 5134
	Knob	T52-549	On-Off-Volume-Models 5136, 5137
	Knob	T52-544	Contrast-Models 5132A, 5132B, 5134, 5133A, 5133B, 5135
	Knob	T52-550	Contrast-Models 5136, 5137
	Knob	T52-552	Auxilliary controls (4 used)-Models 5132A, 5132B, 5134, 5133A, 5133B, 5135
	Knob	T52-553	Auxiliary controls (4 used)-Models 5136, 5137
	Disc.	T52-533	UHF Channel Indicator-Models 5133A, 5133B, 5135, 5137
	Safety Glass	T48-98	Models 5132A, 5133A
	Safety Glass	T48-97	Models 5132B, 5134, 5136, 5133B, 5135, 5137
	Mask	T31-288	Models 5132A, 5133A
	Mask	T31-278	Models 5132B, 5134, 5136, 5133B, 5135, 5137



UHF-VHF TUNER TOP VIEW

PROPERTY OF
L. F. BLANKENSHIP
3924 MEADE ST.
DENVER, COLORADO

ALTERNATE TUNER SCHEMATIC

VHF TUNER T95-47 USED WITH CHASSIS 528.34300, 528.34301, AND 528.34400

A PHOTOFACT STANDARD NOTATION SCHEMATIC
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SILVERTONE MODELS 5132A, B, 5133A, B, 5134, 5135, 5136, 5137 (Ch. 528.33400, 528.33500, 528.33501, 528.34300, 528.34301, 528.34400)

SERVICING IN THE FIELD

TUNER OSCILLATOR ADJUSTMENTS

For touch-up adjustment of VHF tuner oscillator adjustments, it is necessary to remove the chassis from the cabinet. (See disassembly instructions).

PICTURE TUBE SAFETY GLASS CLEANING

To clean safety glass remove 5 wood screws holding metal strip at the top of the safety glass. Remove metal strip and safety glass. Use extreme caution when removing safety glass.

PICTURE TUBE REMOVAL

For picture tube removal it is necessary to remove chassis. (See disassembly instructions).

SERVICE ADJUSTMENT LOCATION

See tube placement chart on page 5.

HORIZONTAL OSCILLATOR FIELD ADJUSTMENT

For adjustment of the horizontal oscillator it is necessary to remove the rear cover and supply power to the set.

Adjustment is located on top of the chassis. Set the horizontal hold control at the center of its range and adjust the horizontal frequency slug (L44) until picture synchronizes horizontally.

SOUND IF DETECTOR BUZZ ADJUSTMENT

To eliminate sound IF detector buzz, adjust the Ratio Detector Secondary (L43) located on top of chassis. (See tube placement chart).

CENTERING

Centering is accomplished mechanically by adjusting two magnetic rings around the neck of the picture tube, located flush against the deflection yoke. Rotate the two rings around the neck of the tube until the picture is properly centered.

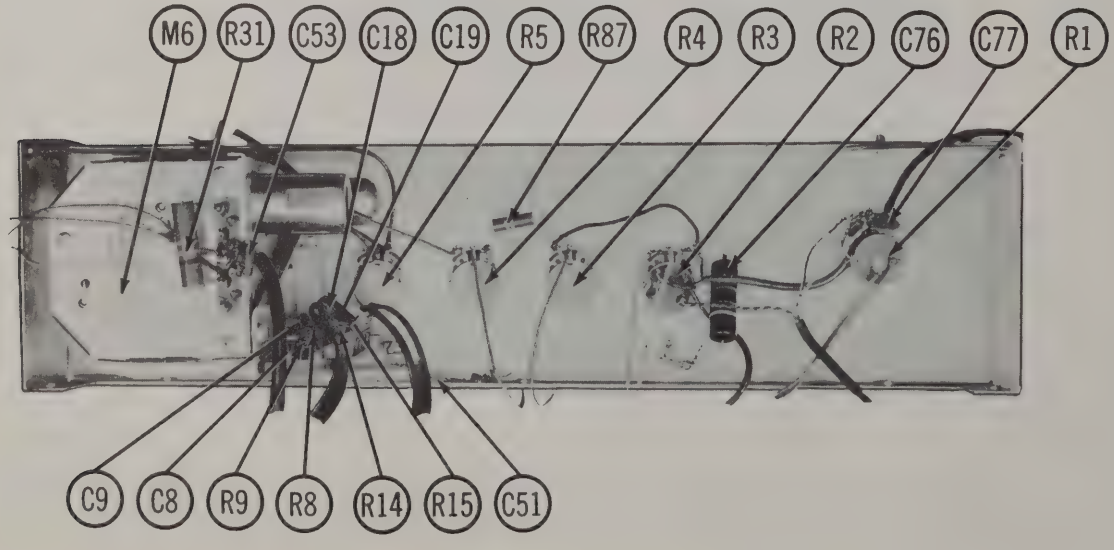
DISASSEMBLY INSTRUCTIONS

CHASSIS REMOVAL

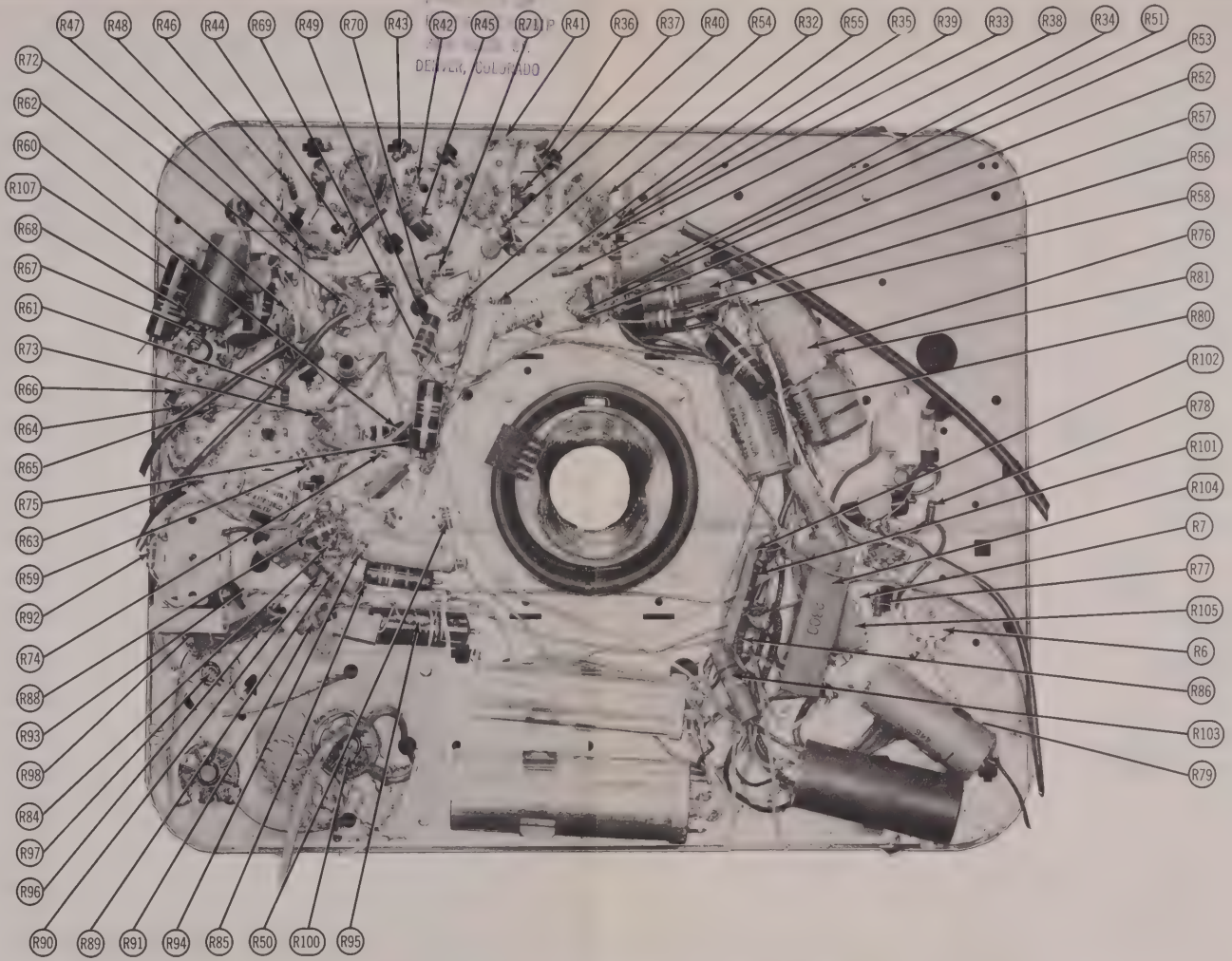
1. Remove 9 push-on type control knobs and trim plate from front panel of cabinet.
2. Remove 6 wood screws. Remove rear cover.
3. Remove 2 wood screws holding antenna bracket.
4. Disconnect speaker leads.
5. Remove 2 wood screws at the rear of chassis mounting board.
6. Remove 4 mounting board bolts. Remove chassis with mounting board.
7. Remove 8 speaker nuts. Remove 2 speakers.

PICTURE TUBE REMOVAL

1. Remove chassis with mounting board.
2. Remove picture tube socket, ion trap and HV lead.
3. Loosen 2 hex nuts on the front tube mounting band.
4. Remove picture tube.

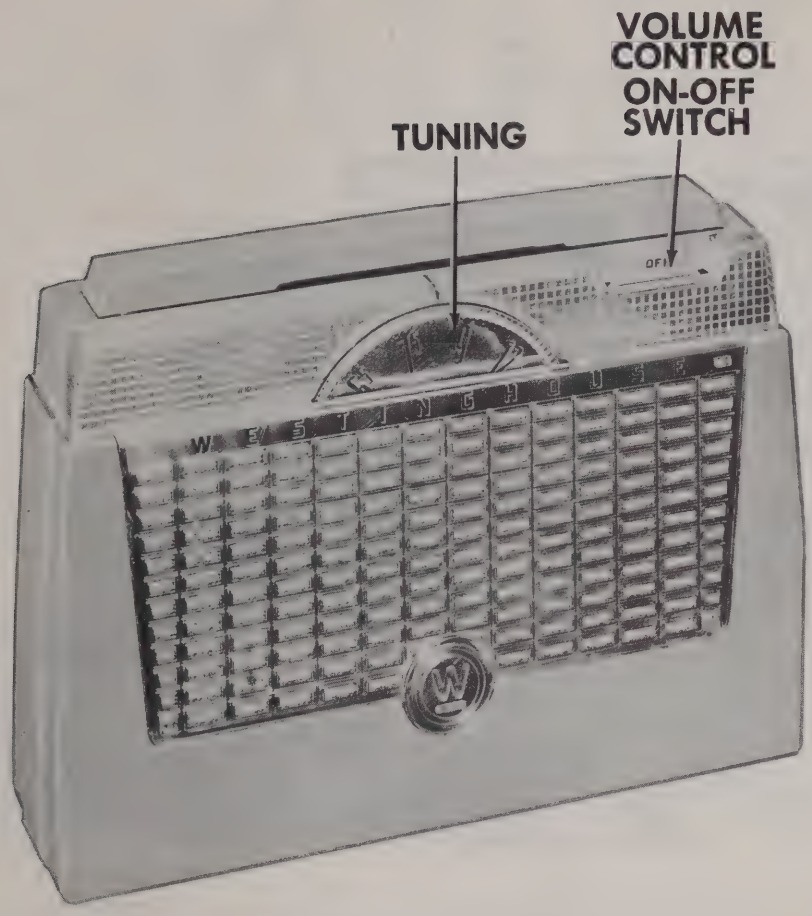


CONTROL PANEL- REAR VIEW



CHASSIS BOTTOM VIEW-RESISTOR IDENTIFICATION

WESTINGHOUSE MODELS H-494P4, H-495P4, H-496P4, (Ch. V-2185



PROPERTY OF
L. F. DIAMOND SHIP
3991 MEADE ST.
DENVER, COLORADO

TRADE NAME	Westinghouse Models H-494P4, H-495P4, H-496P4 (Ch. V-2185-2)
MANUFACTURER	Westinghouse Electric Corp., TV-Radio Div., Metuchen, N. J.
TYPE SET	Battery Operated Portable AM Superheterodyne Receiver
TUBES (Four)	Types 1R5 Conv., 1U4 IF Amp., 1U5 Det.-AVC-AF Amp., 3Q4 Output
POWER SUPPLY RATINGS	1.5 Volts "A" Supply & 67.5 Volts "B" Supply 235 MA @ 1.5 Volts DC & 9MA @ 67.5 Volts DC
TUNING RANGE—BROADCAST	540KC-1600KC

ALIGNMENT INSTRUCTIONS—READ CAREFULLY BEFORE ATTEMPTING ALIGNMENT

Volume control should be at maximum position. Output of signal generator should be no higher than necessary to obtain an output reading. Use an insulated alignment screwdriver for adjusting.
Use battery power, if possible. If AC power is used, use an isolation transformer when available. If not, connect a .1MFD capacitor in series with low side of the signal generator and B-.
Loop should be maintained in same relative position to chassis as when receiver is in cabinet.

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	RADIO DIAL SETTING	OUTPUT METER	ADJUST	REMARKS
1.	.01MFD	High side to antenna terminal lug. Low side to chassis.	455KC (400~Mod.)	Tuning gang fully open	Across voice coil	A1, A2, A3, A4	Adjust for maximum output.
2.		Loop	1625KC	1625KC	"	A5	Fashion loop of several turns of wire and radiate signal into loop of receiver. Adjust for maximum output.
3.		"	1400KC	1400KC	"	A6	"

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PARTS LIST AND DESCRIPTIONS

WESTINGHOUSE
MODELS H-494P4 (Ch. V-2185-2)

TUBES (SYLVANIA, GENERAL ELECTRIC, WESTINGHOUSE)

ITEM No.	USE	REPLACEMENT DATA: Westinghouse PART No.	REPLACEMENT DATA: STANDARD REPLACEMENT	RETMA BASE TYPE	NOTES
V1	Converter	1R5	1R5	7AT	
V2	IF Amp.	1U4	1U4	6AR	
V3	Det-AVC-AF Amp.	1U5	1U5	6BW	
V4	Audio Output	3Q4	3Q4	7BA	

CAPACITORS

Capacity values given in the rating column are in mfd. for Electrolytic and Paper Capacitors, and in mmfd. for Mica and Ceramic Capacitors.

ITEM No.	RATING: CAP.	RATING: VOLT	REPLACEMENT DATA: Westinghouse PART No.	CENTRALAB PART No.	ERIE PART No.	MALLORY PART No.	PYRAMID PART No.	SANGAMO PART No.	
C1	10	90	V-6321-7			TC42	TD-10-150	MT-1512	
C2	10000		R2CC62Z5Z103P	DD-103	811-01	DC511			
C3	5000		R2CC62Z5Z502P	DD-502	811-005	DC525		C-1250	
C4	1000		R2CC61Z5Z152P	DD-102	801-001	DC521		K-1210	
C5	3.3		V-8963-3396	TCZ-3R3	NP0A-3R3	ZT-5533			
C6A	150			DD-151	811-151	UC-5315			
B	10000		♦V-15692-1	DD-103	811-01	DC511			
C	150			DD-151	811-151	UC-5315			
D	5000			DD-502	811-005	DC525			
C7	2000		R2CC61Z5Z5202P	DD-202	801-002	DC522	IMP6-D2	C-1220	

♦ Items C6A, C6B, C6C, C6D, R6A, R6B, and R6C are combined in one unit.

CONTROLS

ITEM No.	RATING: RESISTANCE	RATING: WATTS	REPLACEMENT DATA: Westinghouse PART No.	IRC PART No.	CLAROSTAT PART No.	CENTRALAB PART No.	MALLORY PART No.	INSTALLATION NOTES
R1	2Meg	½	V-11129D-1					Volume & Switch
R1	2Meg	½	V-11129-1					Volume & Switch-Note #1

Note 1. This control used as an alternate in some versions of CH. V-2185-2.

RESISTORS

ITEM No.	RATING: OHMS	RATING: WATT	REPLACEMENT DATA: Westinghouse PART No.	REPLACEMENT DATA: IRC PART No.	NOTES
R2	100KΩ	½	RC20AE104M	BTS-100K	
R3	15KΩ	½	RC20AE153M	BTS-15K	
R4	4.7Meg	½	RC20AE475M	BTS-4.7Meg	
R5	3.3Meg	½	RC20AE335M	BTS-3.3Meg	

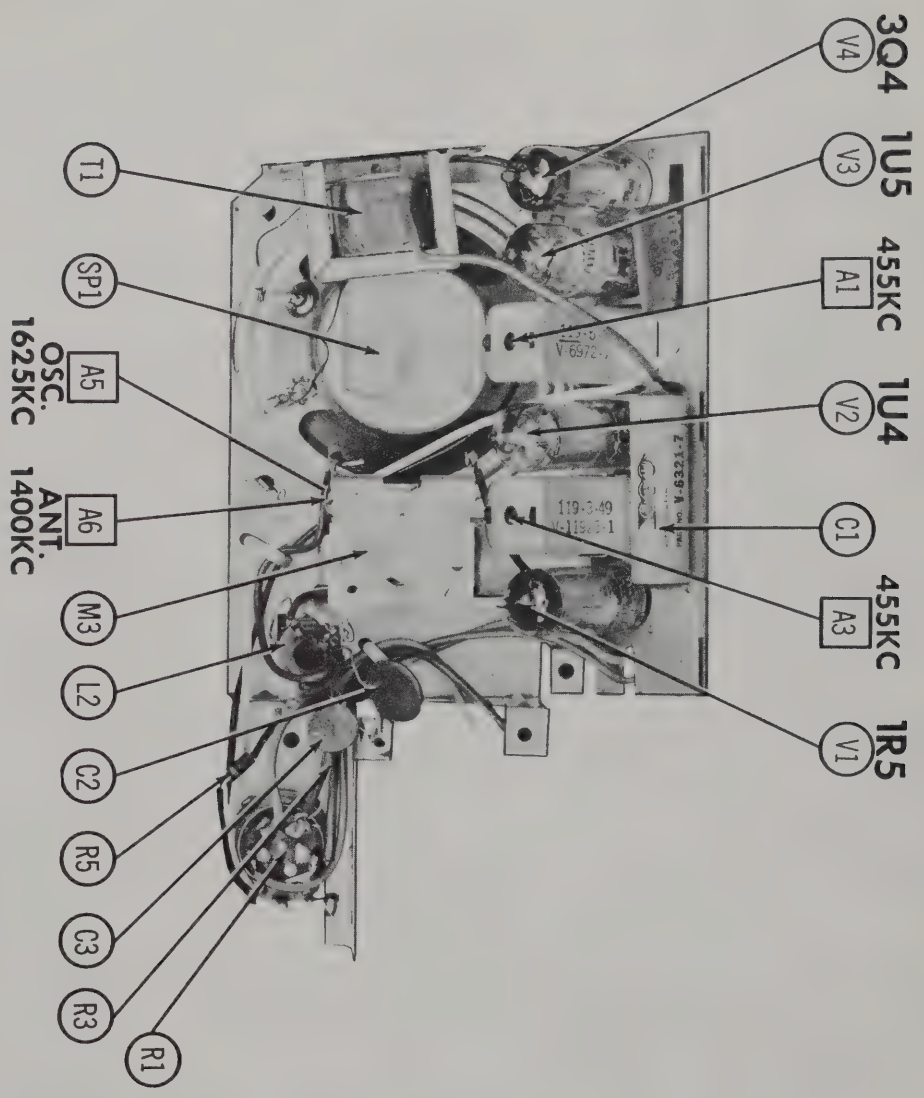
ITEM No.	RATING: OHMS	RATING: WATT	REPLACEMENT DATA: Westinghouse PART No.	REPLACEMENT DATA: IRC PART No.	NOTES
R6A	4.7Meg	½	♦V-15692-1	BTS-4.7Meg	
B	1Meg	½		BTS-1Meg	
C	3.3Meg	½		BTS-3.3Meg	
R7	390Ω	½	RC20AE391K	BTS-390	

♦ Items R6A, R6B, R6C, C6A, C6B, C6C, & C6D are combined in one unit.

TRANSFORMER (AUDIO OUTPUT)

ITEM No.	IMPEDANCE: PRI.	IMPEDANCE: SEC.	REPLACEMENT DATA: Westinghouse PART No.	Halldorson PART No.	Merit PART No.	Stancor PART No.	Thordarson PART No.	Triad PART No.	NOTES
T1	9.3KΩ	3.6Ω	V-11926-2		A-2927①	A-3329	24S49		① Drill one new mtg. hole

CHASSIS—TOP VIEW



PARTS LIST AND DESCRIPTIONS (Continued)

SPEAKER

ITEM No.	RATINGS			REPLACEMENT DATA		NOTES
	SIZE	FIELD	V. C. IMP.	Westinghouse PART No.	QUAM PART No.	
SP1	3½"	PM	3.6Ω	V-11924-1	3A07	

COILS (RF-IF)

ITEM No.	USE	DC RES.		REPLACEMENT DATA				NOTES
		PRI.	SEC.	Westinghouse PART No.	MEISSNER PART No.	MERIT PART No.	MILLER PART No.	
L1	Ant. Coil	.7Ω		V-11921-2	14-1073		69-OSC*	
L2	Osc. Coil	1.7Ω	11.5Ω	V-11128-2			10-C1■	
L3	Input IF	24Ω	24Ω	V-11925-1			10-C2■	
L4	Output IF	17Ω	17Ω	V-6972-7				

* Drill mounting hole
■ Leads sufficient mounting support

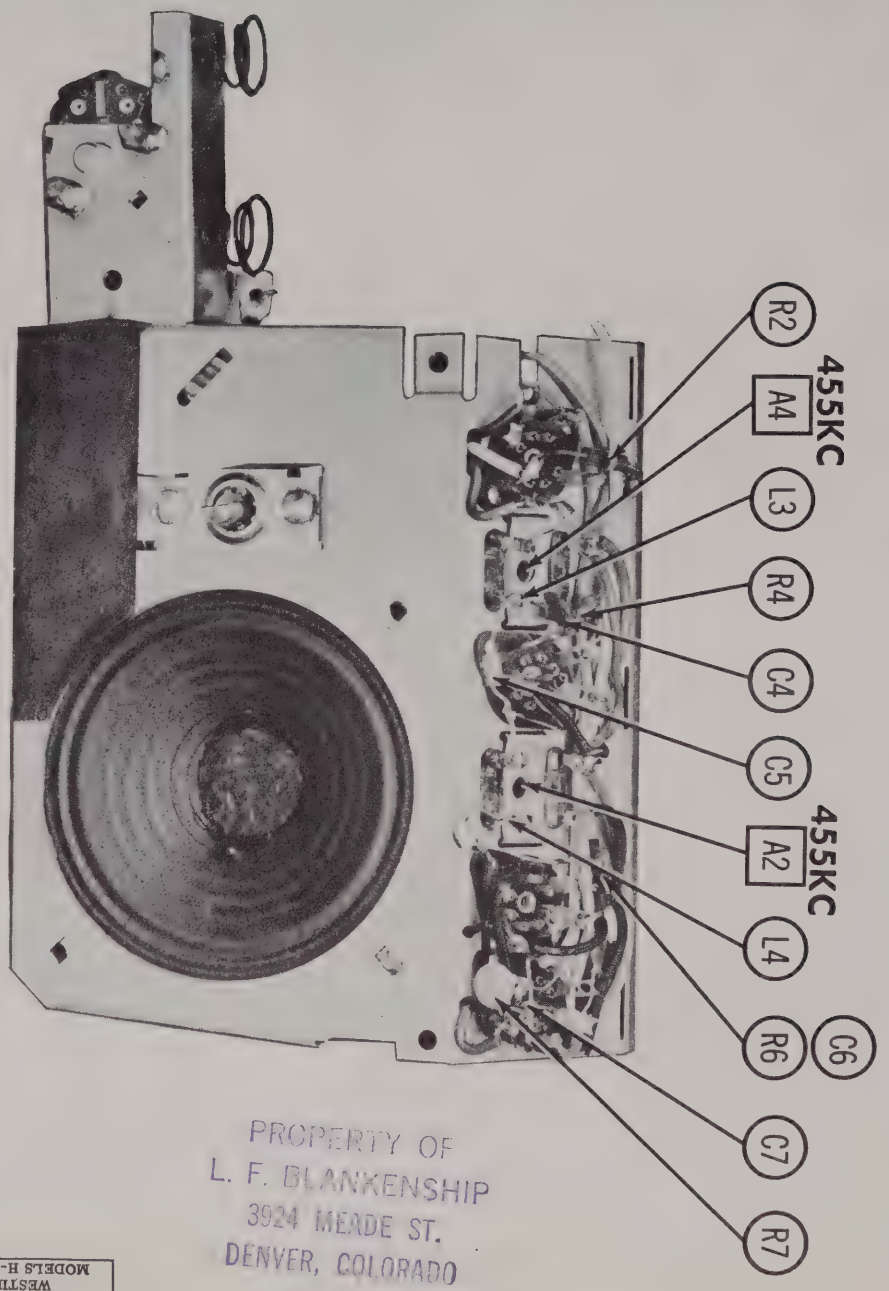
BATTERIES

ITEM No.	VOLTAGE	Westinghouse PART No.	REPLACEMENT DATA						INSTALLATION NOTES
			EVEREADY			BURGESS			
			"A"	"B"	"A-B"	"A"	"B"	"A-B"	
M1	1.5V		964			2IR			Connect 2 in parallel
M2	67.5V			477			P45		

MISCELLANEOUS

ITEM No.	PART NAME	Westinghouse PART No.	NOTES
M3	Tuning Cap.	V-11919-1	2 Gang (23-225 MMF; 10-105 MMF)
	Cabinet Assy.	V-1305-5	Model H-494P4
	Cabinet Assy.	V-1305-6	Model H-495P4
	Cabinet Assy.	V-1305-7	Model H-496P4
	Handle Assy.	V-11938-5	Model H-494P4
	Handle Assy.	V-11938-6	Model H-495P4
	Handle Assy.	V-11938-7	Model H-496P4
	Cover	V-8886-1	Back-Model H-494P4
	Cover	V-8886-2	Back-Model H-495P4
	Cover	V-8886-3	Back-Model H-496P4
	Knob	V-11942-5	On-Off-Volume-Model H-494P4
	Knob	V-11942-6	On-Off-Volume-Model H-495P4
	Knob	V-11942-7	On-Off-Volume-Model H-496P4
	Dial	V-11941-2	Tuning

CHASSIS—BOTTOM VIEW



PROPERTY OF
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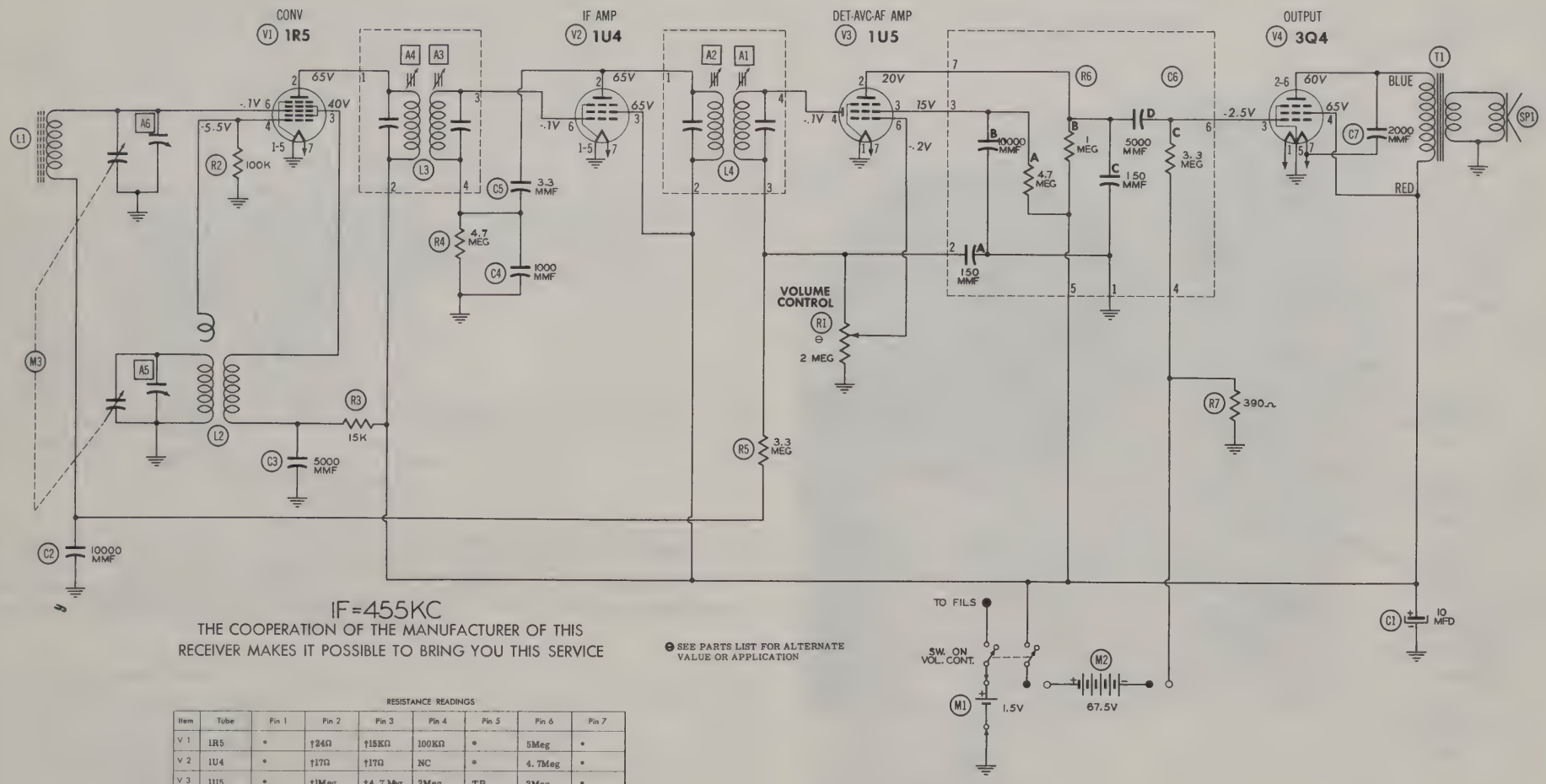
DENVER, COLORADO

WESTINGHOUSE
MODELS H-494P4 (Ch. V-2185-2)



IF=455KC

THE COOPERATION OF THE MANUFACTURER OF THIS RECEIVER MAKES IT POSSIBLE TO BRING YOU THIS SERVICE

⊖ SEE PARTS LIST FOR ALTERNATE VALUE OR APPLICATION

RESISTANCE READINGS

Item	Tube	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7
V 1	1R5	*	†24Ω	†15KΩ	100KΩ	*	5Meg	*
V 2	1U4	*	†17Ω	†17Ω	NC	*	4.7Meg	*
V 3	1U5	*	†1Meg	†4.7 Meg	2Meg	TP	2Meg	*
V 4	3Q4	*	†316Ω	3.3Meg	10KΩ	*	†316Ω	*

* DO NO USE OHMMETER TO MEASURE FILAMENT RESISTANCE.
† MEASURED FROM HIGH SIDE OF C1.
NC - NO CONNECTION
TP - TIE POINT

1. DC voltage measurements taken with vacuum tube voltmeter; AC voltages measured at 1000 ohms per volt.
2. Socket connections are shown as bottom views.
3. Measured values are from socket pin to common negative.
4. Nominal tolerance on component values makes possible a variation of ± 15% in voltage and resistance readings.
5. Volume control at maximum, no signal applied for voltage measurements.

A PHOTOFACT STANDARD NOTATION SCHEMATIC

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ENTY OF
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3924 MEADE ST.
DENVER, COLORADO

MODEL T1816B

ZENITH MODELS
T1814R, T1816B, E, L, R (Ch. 16T20)

HOWARD W. SAMS & CO., INC. • Indianapolis 5, Indiana

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39[illegible] WADE ST.
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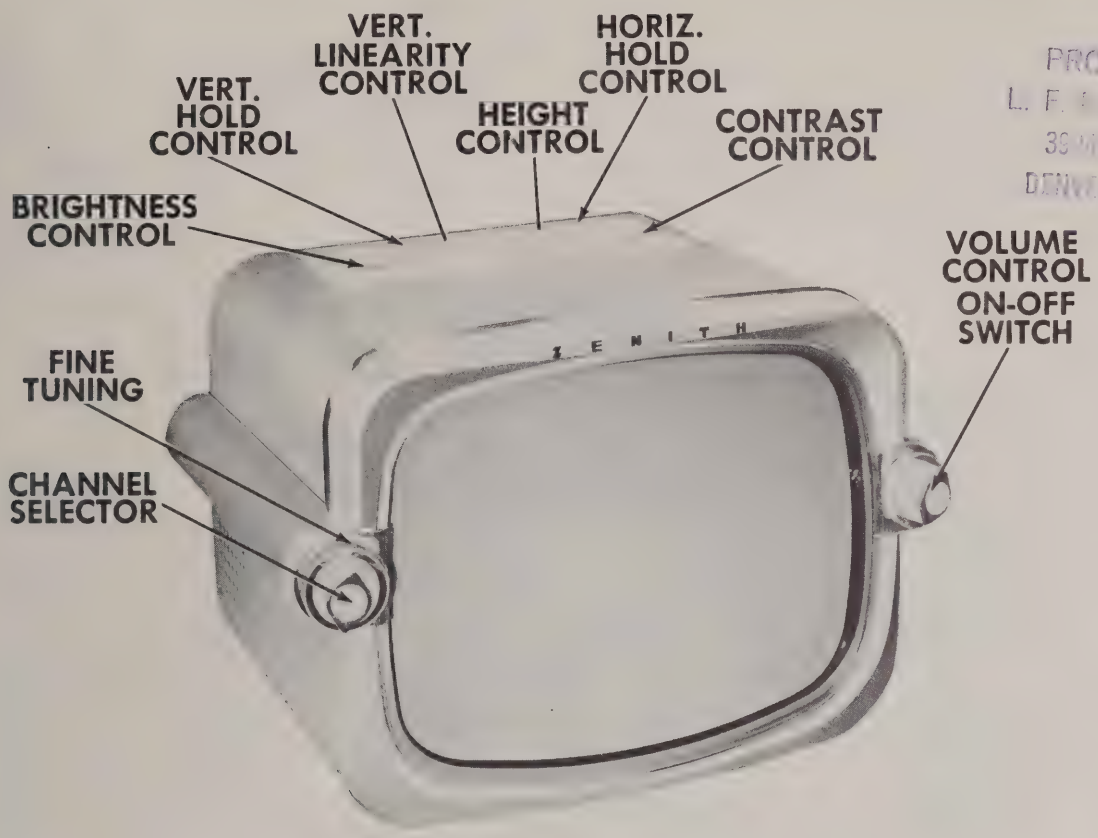

ZENITH MODEL T1816B

TRADE NAME	Zenith Models T1814R, T1816B, T1816E, T1816L, T1816R
MANUFACTURER	Zenith Radio Corp., 6001 Dickens Ave., Chicago 39, Illinois
TYPE SET	Television Receiver
TUBES	Sixteen
POWER SUPPLY	110-120 Volts AC-60 Cycles RATING 1.35 Amp. @ 117 Volts AC
TUNING RANGE	Channels 2 thru 13, Video IF 45.75MC, Sound IF 41.25MC (Intercarrier)

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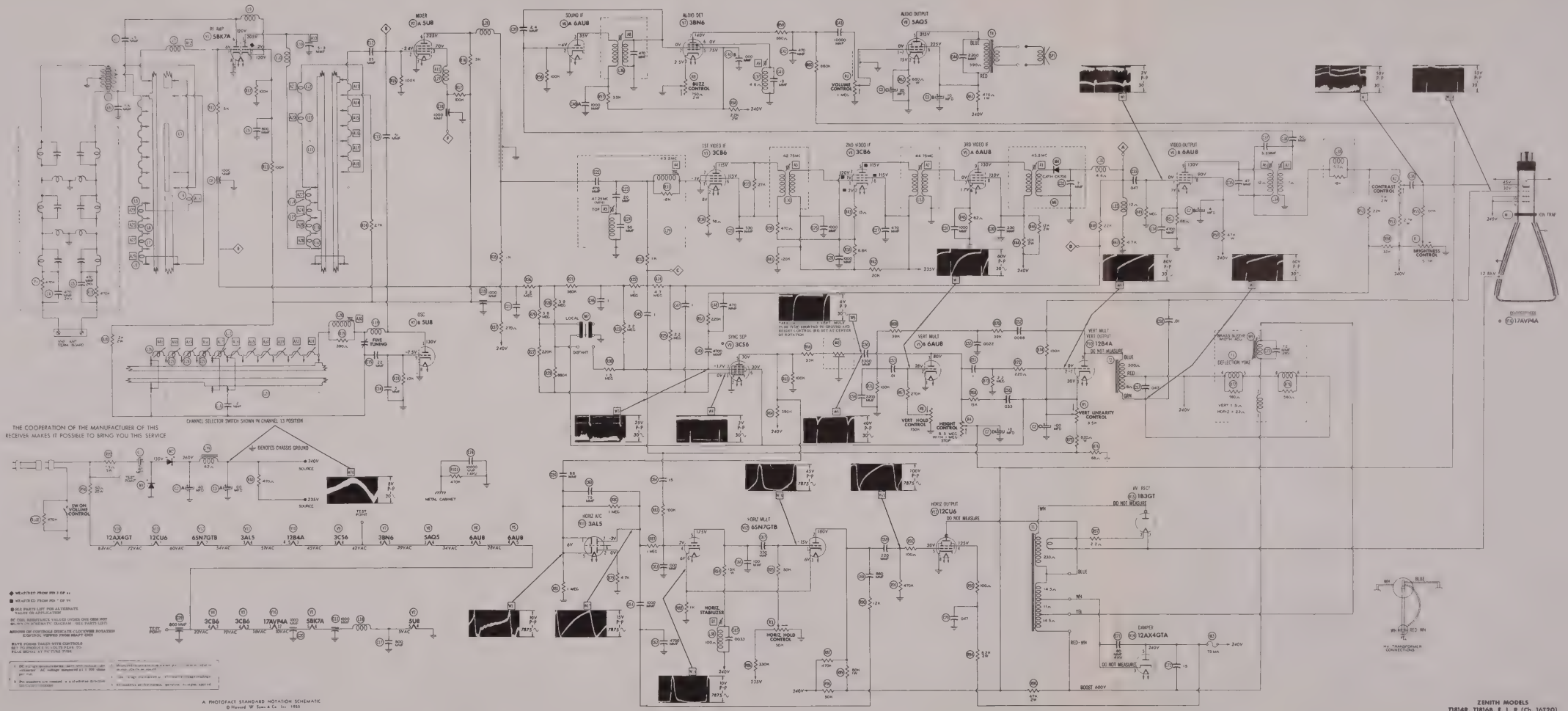
THE COOPERATION OF THE MANUFACTURER OF THIS RECEIVER MAKES IT POSSIBLE TO BRING YOU THIS SERVICE
CHANNEL SELECTOR SWITCH SHOWN IN CHANNEL 13 POSITION
DENOTES CHASSIS GROUND
12AX4GT 12CU6 6SN7GTB 3AL5 12B4A 3CS6 3BN6 5AQ5 6AU8 6AU8
8.4VAC 72VAC 60VAC 54VAC 57VAC 45VAC 42VAC 39VAC 34VAC 28VAC
3CB6 3CB6 17AVP4A 5BK7A 5U8
29VAC 99VAC 18VAC 30VAC 5VAC
A PHOTOFACT STANDARD NOTATION SCHEMATIC
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ZENITH MODELS
T1814R, T1816B, E, L, R (Ch. 16T20)

ZENITH MODELS
T1814R, T1816B, E, L, R (Ch. 16T20)

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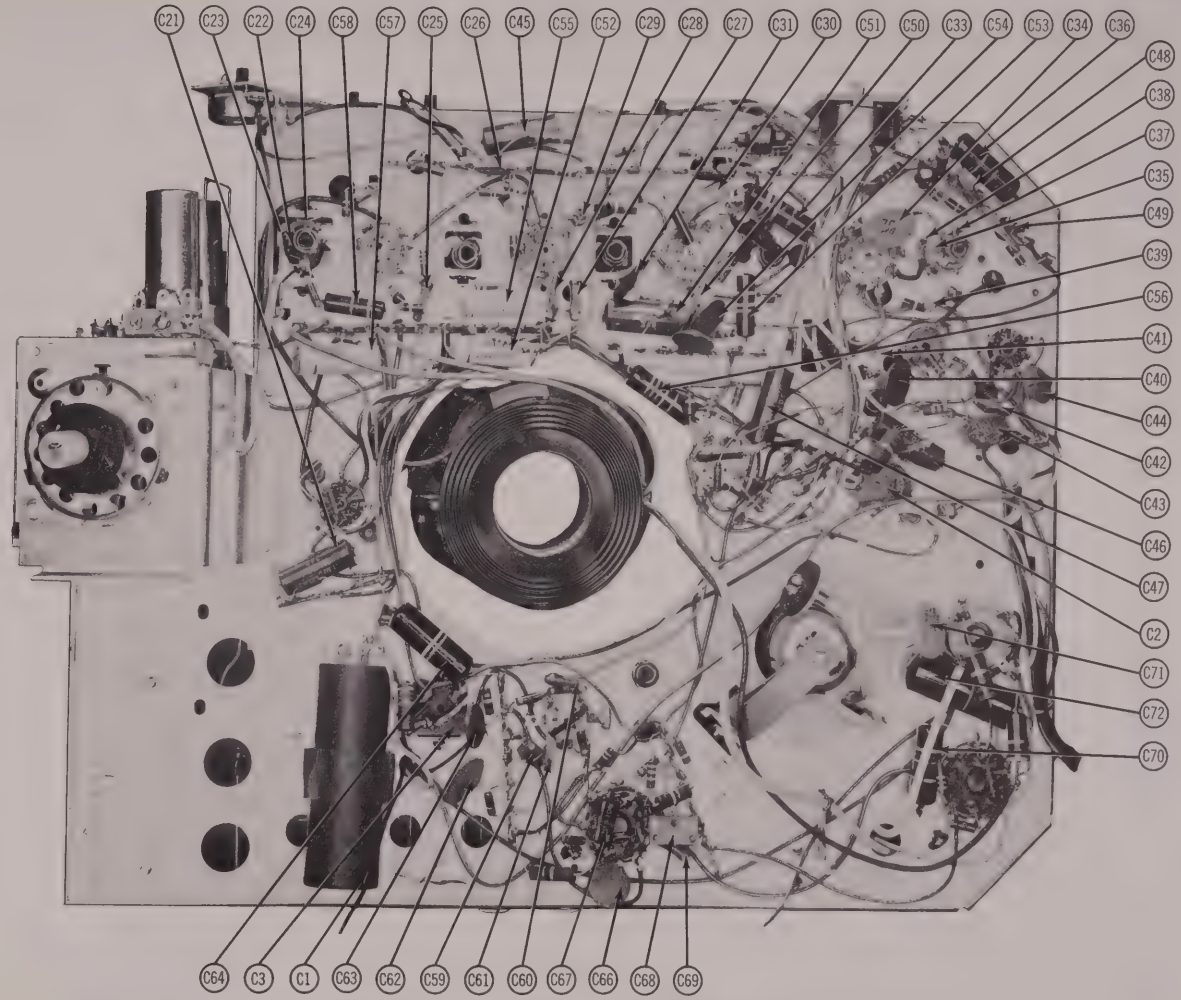
ZENITH MODELS
T1814R, T1816B, E, L, R (Ch. 16T20)
CHASSIS TOP VIEW



CHASSIS BOTTOM VIEW-CAPACITOR IDENTIFICATION

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3924 MEADE ST.
DENVER, COLORADO

TUBE PLACEMENT CHART

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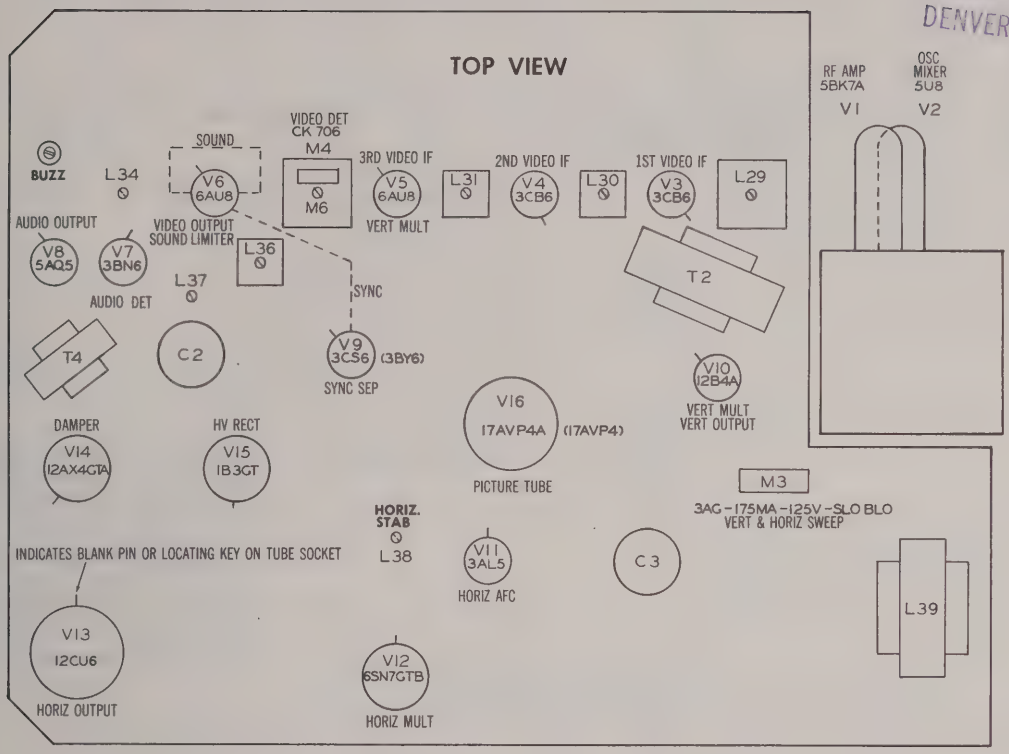
3024 MEADE ST.
DENVER, COLORADO



TUBE FAILURE CHECK CHART

The following chart lists tubes whose failures are most likely to produce the indicated symptoms. Refer to tube placement chart for location and type of tube.

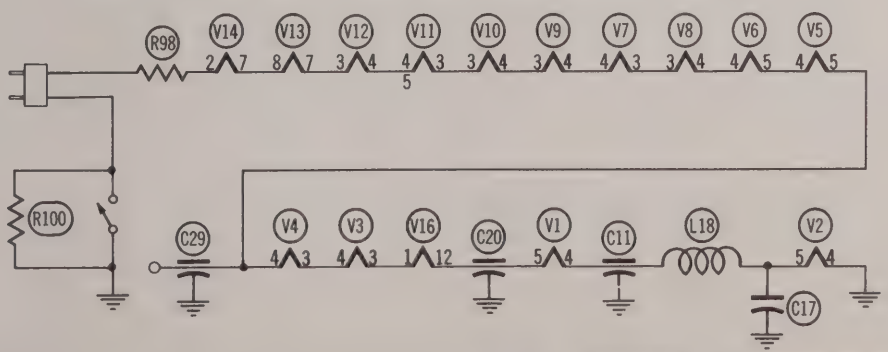
POWER SUPPLY FAILURE
No raster, no sound - **Selenimu Rectifiers (M1 & M2)**

LOSS OF PICTURE OR SOUND
No pic, no sound, has raster - **V2, V3, V4, V5, V6**
No pic, no sound, has snow - **V1, V2, V3**
No pic, has sound, has raster - **V6, V16**
Has pic, no sound - **V7, V8**

SYNC FAILURE
No vert. sync - **V5, V9, V10**
No horiz. sync - **V9, V11, V12**
No vert. or horiz. sync - **V9**

SWEEP FAILURE
No raster, has sound - **V12, V13, V14, V15, V16, Fuse (M3)**
No vertical deflection - **V5, V10**
Poor vert. linearity or foldover - **V5, V10**
Poor horiz. linearity or foldover - **V12, V13, V14**
Narrow picture - **V12, V13, V14, V15, M1, M2**
Vert. off freq. - **V5, V9, V10**
Horiz. off freq. - **V9, V11, V12**

NOTE: Since this receiver employs tubes used in series-parallel filament network, an open filament in any tube in series may cause the set to be inoperative (See circuit below.)



SET 292 FOLDER 12

ZENITH MODELS
T1814R, T1816B, E, L, R (Ch. 16T20)

ALIGNMENT INSTRUCTIONS

ALIGNMENT INSTRUCTIONS—READ CAREFULLY BEFORE ATTEMPTING ALIGNMENT

Use an isolation transformer to protect the test equipment.
If the set is to be aligned with the picture tube removed, the end of the high voltage lead should be securely taped and kept away from chassis.

VIDEO IF ALIGNMENT

Remove the converter tube (V2) from its socket and connect a wire to pin 9. Replace V2 in its socket and connect a clip lead from lose end of wire to chassis.
Connect the negative lead of a 5 volt bias supply to point Ⓒ.
Connect the positive lead to chassis.
Connect a clip lead from point Ⓓ to chassis ground.
In step 6 attenuate sweep generator output to maintain not more than 3 volts peak to peak on scope.
Connect the synchronized sweep voltage from the sweep generator to the horizontal input of the oscilloscope for horizontal deflection.

	DUMMY ANTENNA	SWEEP GENERATOR COUPLING	SWEEP GENERATOR FREQUENCY	MARKER GENERATOR FREQUENCY	CHANNEL	CONNECT SCOPE	ADJUST	REMARKS
1.	470MMF	High side to point Ⓑ. Low side to chassis.	Not used	45.5MC (Unmod)	Any	Use VTVM. DC probe thru 10KΩ to point Ⓐ. Common to chassis.	A1	Attenuate generator output to maintain not more than -2 volts at VTVM. Adjust for maximum deflection.
2.	"	"	"	44.75MC	"	"	A2	"
3.	"	"	"	42.75MC	"	"	A3	"
4.	"	"	"	43.5MC	"	"	A4	"
5.	"	"	"	47.25MC	"	"	A5	Increase generator output for usable reading on VTVM. Adjust for MINIMUM deflection. Repeat steps 1 thru 4.
6.	"	"	43.0MC (10MC Swp)	41.25MC 42.75MC 45.0MC 45.75MC 47.25MC	"	Vert. Amp. thru 10KΩ to point Ⓐ. Low side to chassis.		Check for response similar to Fig. 1. If necessary retouch A1 thru A5 to obtain desired response. Adjust A4 for maximum amplitude of response curve and position of 45.75MC marker. Adjust A3 for correct position of 42.75MC marker. Adjust A1 and A2 for correct band width. Increase sweep output and check position of 47.25MC trap. If necessary SLIGHTLY retouch A5 for correct position of 47.25MC marker. The 41.25MC marker should be in proper position on response curve after correct band pass and other marker positions are obtained. Remove wire from pin 9 of V2. Disconnect bias supply and clip lead from point Ⓓ.

SOUND IF ALIGNMENT

Connect an attenuator (Zenith part #S-17203 or equivalent) in series with the receiver antenna.
Tune in a tone modulated TV signal and adjust the attenuator until the signal falls below the limiting level of the 3BN6 audio detector, as evidenced by a hiss similar to super-regeneration.
Adjust the sound take off transformer (A6 and A7), the sound IF transformer(A8) and the quadrature coil A9 for maximum sound of best quality.
Adjust the buzz control (R8) for minimum intercarrier buzz.
If during alignment of the sound IF the signal rises above the limiting level of the 3BN6 (hiss disappears), increase the attenuation until hiss returns.

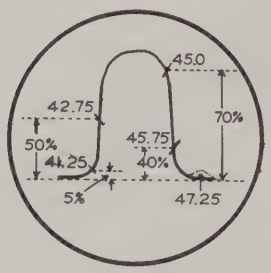
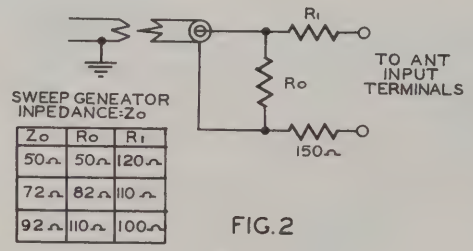


FIG.1



Zo	Ro	R1
50Ω	50Ω	120Ω
72Ω	82Ω	110Ω
92Ω	110Ω	100Ω

FIG.2

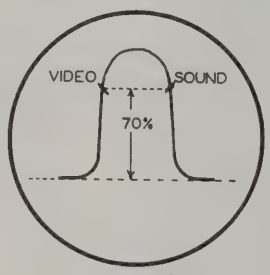


FIG.3

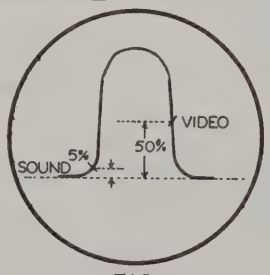


FIG.4

ALIGNMENT INSTRUCTIONS (cont)

RF AND MIXER ALIGNMENT

Connect the negative lead of a 2 volt bias supply to point (F) on tuner.
Connect the positive lead to chassis.
Set the RF trimmer (A10) at its center adjustment position. A10 should not require further adjustment unless the RF tube V1 is replaced.
Preset A37 at its center adjustment position. In step 14 adjustment of A21 is not necessary if proper bandpass is obtainable by adjusting A20.
Connect the synchronized sweep voltage from the sweep generator to the horizontal input of the oscilloscope for horizontal deflection.
The sweep generator output lead should be terminated with its characteristic impedance, usually 50 ohms.

	DUMMY ANTENNA	SWEEP GENERATOR COUPLING	SWEEP GENERATOR FREQUENCY	MARKER GENERATOR FREQUENCY	CHANNEL	CONNECT SCOPE	ADJUST	REMARKS
7.	Fig. 2	Across antenna terminals thru matching network (Fig. 2).	213MC (10MC Swp)	211.25MC 215.75MC	13	Vert. Amp. thru 10KΩ to point (F). Low side to chassis.	A11, A12	Check for response curve as in Fig. 3. If necessary, adjust A-11 by expanding or compressing coil turns for proper band width. Adjust A12 by expanding or compressing coil turns for maximum amplitude of response curve.
8.	"	"	207MC (10MC Swp)	205.25MC 209.75MC	12	"	A13	Check for response curve similar to Fig. 3. If necessary, adjust by bending loop in or out from switch rotor for proper response.
9.	"	"	201MC (10MC Swp)	199.25MC 203.75MC	11	"	A14	"
10.	"	"	195MC (10MC Swp)	193.25MC 197.75MC	10	"	A15	"
11.	"	"	189MC (10MC Swp)	187.25MC 191.75MC	9	"	A16	"
12.	"	"	183MC (10MC Swp)	181.25MC 185.75MC	8	"	A17	"
13.	"	"	177MC (10MC Swp)	175.25MC 179.75MC	7	"	A18	"
14.	"	"	85MC (10MC Swp)	83.25MC 87.75MC	6	"	A19, A20, A21	Adjust A20 and A21 for correct band pass. Adjust A19 for maximum amplitude similar to Fig. 3. A19, A20 and A21 are adjusted by expanding or compressing coil turns.
15.	"	"	79MC (10MC Swp)	77.25MC 81.75MC	5	"	A22, A23	Adjust by expanding or compressing coil turns for response curve similar to Fig. 3.
16.	"	"	69MC (10MC Swp)	67.25MC 71.75MC	4	"	A24, A25	"
17.	"	"	63MC (10MC Swp)	61.25MC 65.75MC	3	"	A26, A27	"
18.	"	"	57MC (10MC Swp)	55.25MC 59.75MC	2	"	A28, A29	"

OSCILLATOR ALIGNMENT

Connect bias as under "Video IF Alignment."
Set the fine tuning control to the position where the brass flat shaft is in horizontal position. Leave it at this mid-range position during entire oscillator alignment.
Connect the synchronized sweep voltage from the sweep generator to the horizontal input of the oscilloscope for horizontal deflection.
The sweep generator output lead should be terminated with its characteristic impedance, usually 50 ohms.

	DUMMY ANTENNA	SWEEP GENERATOR COUPLING	SWEEP GENERATOR FREQUENCY	MARKER GENERATOR FREQUENCY	CHANNEL	CONNECT SCOPE	ADJUST	REMARKS
19.	Fig. 2	Across antenna terminals thru matching network. (Fig. 2).	213MC (10MC Swp)	211.25MC 215.75MC	13	Vert. Amp. thru 10KΩ to point (A). Low side to chassis.	A30	Adjust to place video marker at 50% on response curve as in Fig. 4. Sound marker should be at 5%.
			207MC (10MC Swp)	205.25MC 209.75MC	12		A31	
			201MC (10MC Swp)	199.25MC 203.75MC	11		A32	
			195MC (10MC Swp)	193.25MC 197.75MC	10		A33	
			189MC (10MC Swp)	187.25MC 191.75MC	9		A34	
			183MC (10MC Swp)	181.25MC 185.75MC	8		A35	
			177MC (10MC Swp)	175.25MC 179.75MC	7		A36	
			85MC (10MC Swp)	83.25MC 87.75MC	6		A37	
			79MC (10MC Swp)	77.25MC 81.75MC	5		A38	
			69MC (10MC Swp)	67.25MC 71.75MC	4		A39	
			63MC (10MC Swp)	61.25MC 65.75MC	3		A40	
			57MC (10MC Swp)	55.25MC 59.75MC	2		A41	

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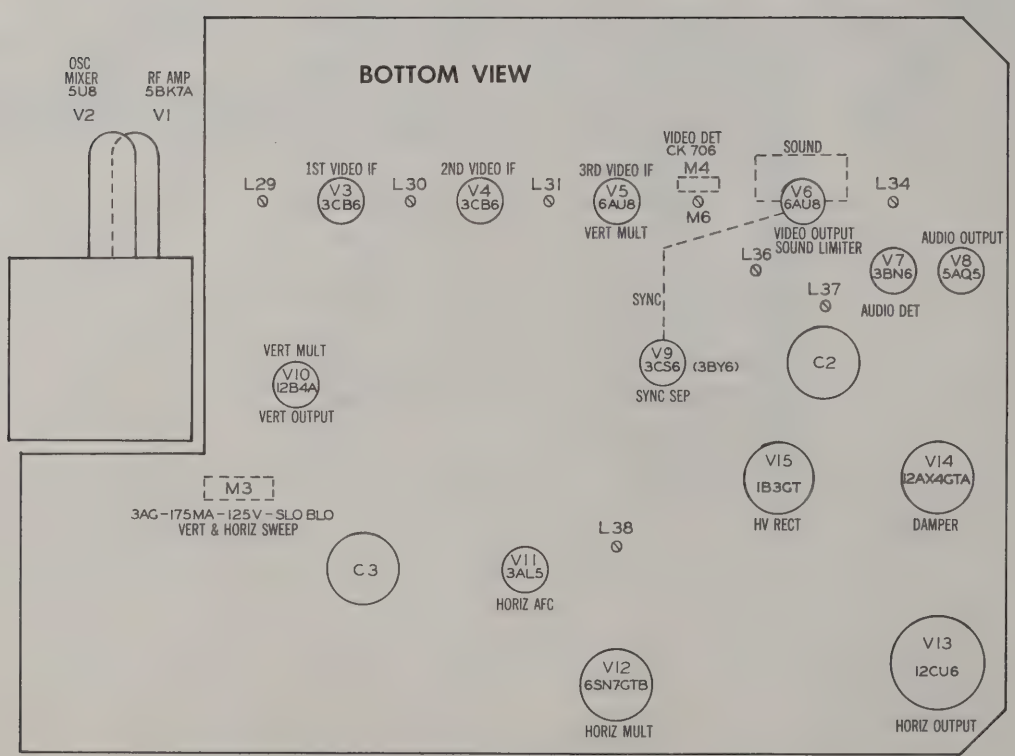
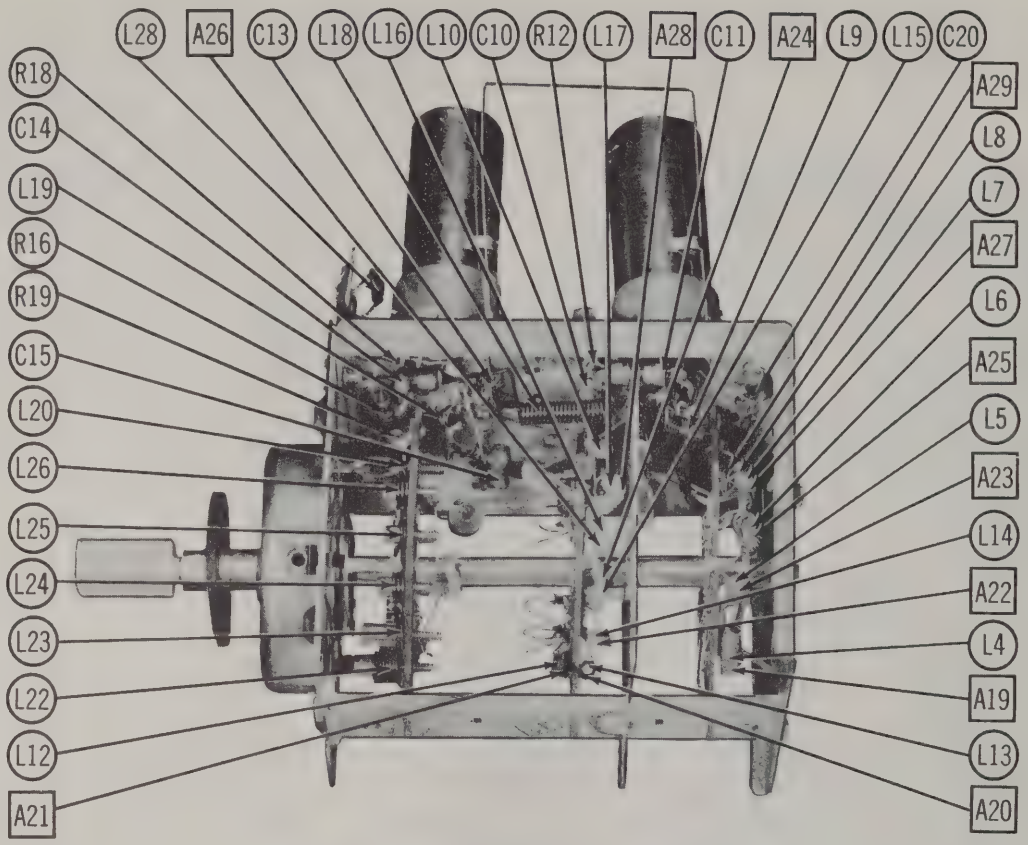
RESISTANCE MEASUREMENTS

Item	Tube	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8	Pin 9
V 1	5BK7A	†3KΩ	70KΩ	Inf.	2Ω	3Ω	Inf.	4Meg	0Ω	0Ω
V 2	5U8	†12KΩ	100KΩ	†100KΩ	0Ω	2Ω	†1. 3KΩ	0Ω	0Ω	10KΩ
V 3	3CB6	1. 6Meg	56Ω	4Ω	5Ω	▲470Ω	▲470Ω	0Ω		
V 4	3CB6	70KΩ	15Ω	5Ω	6Ω	†600Ω	†600Ω	70KΩ		
V 5	6AU8	0Ω	500KΩ	▲3Meg	8Ω	6Ω	82Ω	. 1Ω	†6KΩ	†6KΩ
V 6	6AU8	0Ω	100KΩ	†55KΩ	9Ω	8Ω	68Ω	1Meg	†47KΩ	†8. 5KΩ
V 7	3BN6	350Ω	. 2Ω	10Ω	11Ω	†22KΩ	4. 8Ω	▲750KΩ		
V 8	5AQ5	300KΩ	680Ω	10Ω	9Ω	†1. 3KΩ	†600Ω	300KΩ		
V 9	3CS6	220KΩ	0Ω	12Ω	11Ω	†100KΩ	2. 4KΩ	1. 5Meg		
V 10	12B4A	2. 4KΩ	2. 2Meg	12Ω	14Ω	14Ω	TP	2. 2Meg	TP	†600Ω
V 11	3AL5	1Meg	4. 7KΩ	15Ω	14Ω	1Meg	NC	2Meg		
V 12	6SN7GTB	180KΩ	▲180KΩ	1KΩ	3Meg	†15KΩ	1KΩ	15Ω	17Ω	
V 13	12CU6	TP	20Ω	TP	†8. 2KΩ	470KΩ	TP	17Ω	0Ω	TOP CAP ▲14. 5Ω
V 14	12AX4GTA	TP	NC	150KΩ	NC	†65Ω	NC	23Ω	20Ω	
V 15	1B3GT	PINS	1-8	HA VE	INF	RESISTANCE				TOP CAP ▲248Ω
V 16	17AVP4A	4Ω	100KΩ	PIN6 †62Ω	PIN 10 †62Ω	PIN 11 †170KΩ	PIN 12 3Ω			

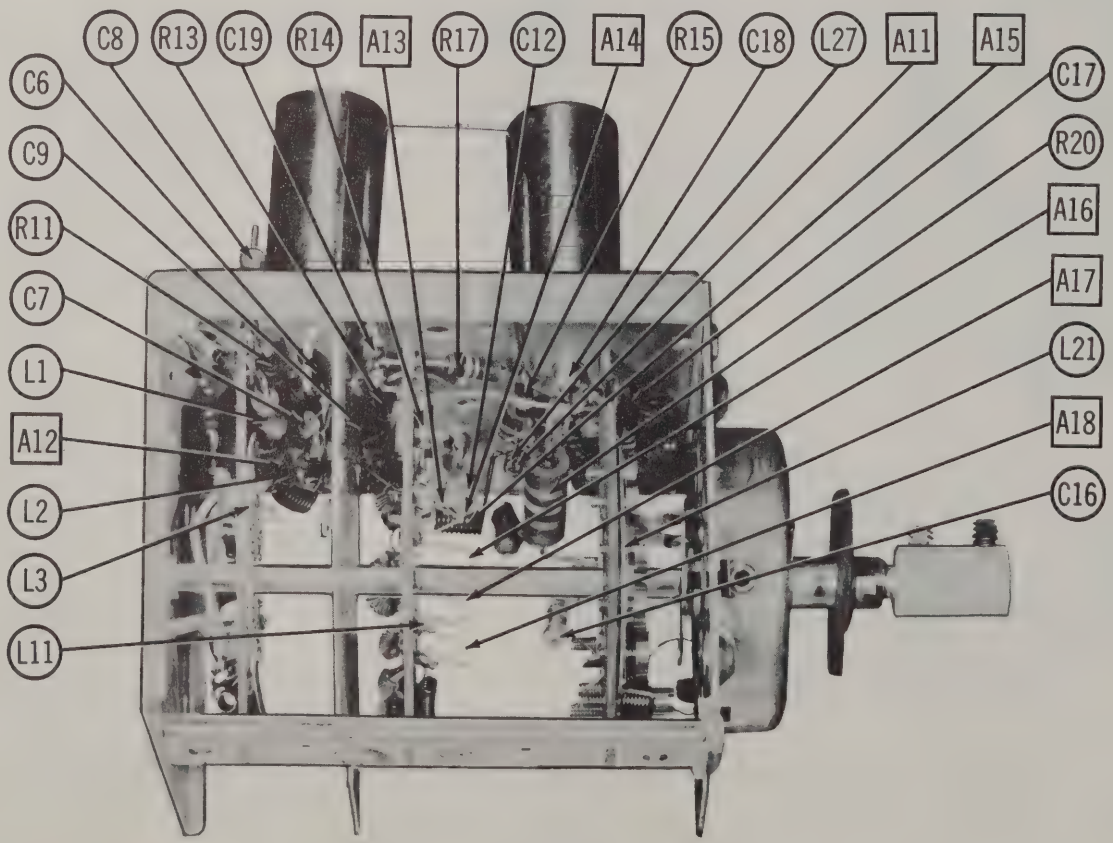
†MEASURED FROM OUTPUT OF M2.
▲MEASURED FROM PIN 7 OF V4.
▲MEASURED FROM PIN 3 OF V14.
TP-TIE POINT.
NC-NO CONNECTION.



TUBE PLACEMENT CHART



RF TUNER-RIGHT SIDE



RF TUNER-LEFT SIDE

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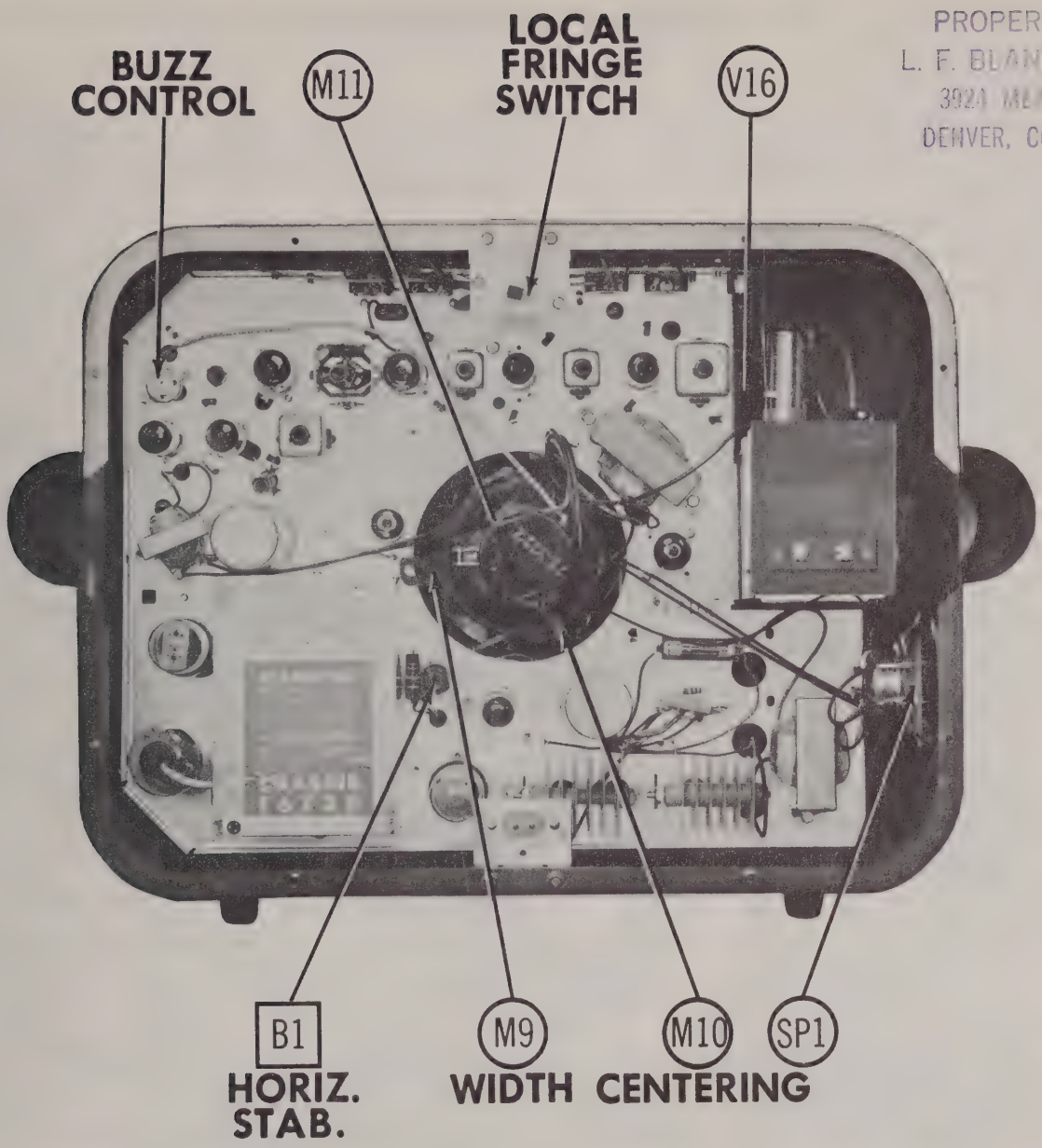

CABINET—REAR VIEW

HORIZONTAL SWEEP CIRCUIT ADJUSTMENTS

Turn the set on and tune in a TV station, preferably a test pattern.

1. Connect a .5MFD capacitor from the junction of C65, L38, R84 and chassis.
2. Set the horizontal hold control until the picture synchronizes horizontally; picture may not remain steady.
3. Remove the .5MFD capacitor from junction of C65, L38, R84 and chassis.
4. Adjust the horizontal stabilizer slug (B1) until picture again locks into horizontal sync without readjusting the horizontal hold control.

TROUBLE SHOOTING AIDS

SWEEP

HORIZONTAL

LOSS OF SWEEP

Follow procedure outlined under "Loss of High Voltage."

INSUFFICIENT SWEEP

Check by substitution V13 and V14. Check M1 and M2. Check R94, R99, C1, C69, T1, T3A and other associated components.

DRIVE LINES

Check by substitution V13 and V14. Check C68, C69, R90, R94, T1, T3A and other associated components.

COMPRESSED LEFT SIDE

Check by substitution V13 and V14. Check horizontal output and damper stages for component failure or change of value.

FOLDS

Follow procedure outlined under "Drive Lines."

PIE CRUST EFFECT

Check by substitution V12, V13 and V14. Check C63 for open. Check L38, C61, C62, R83, R84 and other associated components.

XMAS TREE EFFECT

Check by substitution V12, V13 and V14. Check T1 and T3 for internal arcing. Check L38, C65, C64, C60, C67, R79 and other associated components.

VERTICAL

LOSS OF SWEEP

Check by substitution V5 and V10. Check waveform W8.

If Satisfactory	If Unsatisfactory
Check T2, T3B, R95, R96, R76, C2C and other associated components.	Check R4, R67, C50, C51 and other associated components.

INSUFFICIENT SWEEP

Check by substitution V5 and V10. Check vertical size and vertical linearity controls for proper operation.

COMPRESSED AT BOTTOM

Check by substitution V5 and V10. Check R4, C51 and other associated components.

COMPRESSED AT TOP

Check by substitution V5 and V10. Check R76, R75, R5, C2C, T2 and other associated components.

FOLDS

Check by substitution V5 and V10. Check R68, C56, C51, C52 and other associated components.

SYNC

LOSS OF VERTICAL AND HORIZONTAL SYNC

Substitute V9. Check C47, C49, C48, R64 and other associated components.

LOSS OF VERTICAL SYNC-HORIZONTAL SYNC SATISFACTORY

Substitute V5. Check vertical integrator network. Check R67, R6, C53, C51, C50 and other associated components.

LOSS OF HORIZONTAL SYNC-VERTICAL SYNC SATISFACTORY

Check by substitution V11 and V12. Check C59, C60, C63, L38, R80, R83 and other associated components.

HORIZONTAL BENDING

Check by substitution V9, V11 and V12. Check horizontal AFC network.

VIDEO

LOSS OF VIDEO

Substitute V6. Check C33, C36, C2B, R53, R51, R50, L32 and other associated components.

SOUND BARS (4.5MC BEAT)

Adjust tuner fine tuning for best sound and picture. Check adjustment A6. Check video IF alignment.

POOR CONTRAST

Substitute V6. Check L35, R53, R52, R54, C33, C36 and other associated components.

NEGATIVE PICTURE

Substitute V6. Check picture tube. Check video crystal detector network. Check C33, C36 and other associated components.

SMEAR

Substitute V6. Check L32, L33, L35, C33, C36, R51 and other associated components.

WIDE BLACK BAR ACROSS PICTURE

Check by substitution V1, V3, V4, V5 and V6 for heater to cathode leakage.

AUDIO

WEAK OR NO SOUND

Check by substitution V6, V7 and V8. Check stages V7 and V8 using audio signal generator. Apply audio signal across R1.

If Satisfactory	If Unsatisfactory
Check audio detector and audio IF stages for component failure or change of value.	Check C42, C43, C44, C3C, C3B, R61, R62, R60, R59, T4, speaker and other associated components.

BUZZ

Adjust tuner fine tuning for best sound and picture. Check adjustments A9 and R8 for minimum buzz. If still unsatisfactory, check audio IF alignment.

DISTORTED

Follow procedure outlined under "Weak or no Sound."

POWER

DEAD SET

If filaments fail to light, check all tubes. These tubes are connected in series. Check AC interlock assembly. Check R98 and switch on volume control. If filaments light, check M1, M2, R99 and C1. Check B+ filter and decoupling network.

SMALL AND/OR DIM PICTURE

Check M1, M2, C1 and R99. Check B+ filter and decoupling network.

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3924 MEADE ST.
DENVER, COLORADO

CHASSIS BOTTOM VIEW-TRANS., INDUCTOR AND ALIGNMENT IDENTIFICATION

ZENITH MODELS

T1814R, T1816B, E, L, R (Ch. 16T20)

L. F. BLANKENSHIP
3924 MEADE ST.
DENVER, COLORADO

PARTS LIST AND DESCRIPTIONS

TUBES (SYLVANIA, GENERAL ELECTRIC, WESTINGHOUSE)

ITEM No	USE	REPLACEMENT DATA: ZENITH PART No.	STANDARD REPLACEMENT	RETMA BASE TYPE	NOTES
V1	RF Amp.	5BK7A	5BK7A	9AJ	
V2	Mixer-Osc.	5U8	5U8	8AR	
V3	1st Video IF Amp.	3CB6	3CB6	7CM	
V4	2nd Video IF Amp.	3CB6	3CB6	7CM	
V5	3rd Video IF Amp. - Vert. Mult.	6AU8	6AU8		
V6	Video Output - Sound Limiter	6AU8	6AU8		
V7	Audio Det.	3BN6	3BN6	7DF	
V8	Audio Output	5AQ5	5AQ5	7BZ	
V9	Sync Sep.	3CS6	3CS6	7CH	3BY6 used as alternate.
V10	Vert. Mult. - Vert. Output	12B4A	12B4A	9AG	
V11	Horiz. AFC	3AL5	3AL5	8BT	
V12	Horiz. Mult.	6BN7GTB	6BN7GTB	8BD	
V13	Horiz. Output	12CU6	12CU6	6AM	
V14	Damper	12AX4GTA	12AX4GTA	4CG	
V15	HV Rect.	1B3GT	1B3GT	3C	

CATHODE-RAY TUBE

ITEM No	REPLACEMENT DATA: ZENITH PART No.	CBS PART No	GENERAL ELECTRIC PART No.	SYLVANIA PART No	WESTINGHOUSE PART No	RETMA BASE TYPE	NOTES
V16	17AVP4A ① 17AVP4	17AVP4A ①		17AVP4A ② 17AVP4		12L 12L	① Aluminized ② Silver screen

CAPACITORS

Capacity values given in the rating column are in mfd. for Electrolytic and Paper Capacitors, and in mmfd. for Mica and Ceramic Capacitors.

ITEM No.	RATING: CAP.	RATING: VOLT	REPLACEMENT DATA: ZENITH PART No.	CENTRALAB PART No.	ERIE PART No.	MALLORY PART No.	PYRAMID PART No.	SANGAMO PART No.	NOTES
C1	140	150	33-2636			WA437		TM-140-150	S-100
C2A	●140	300	33-2640					TM-3095	T-E20
B	▲4	500						TD-150-300	T-417
D	100	50							
D	▲10	475							
C3A	●100	300	33-2639			FP389.1	TM-4014		Q-280
B	▲10	300							
C	▲20	25							
C4	470	3000		DD30-471	3KV-471	DC30347			K-2347
C5	470	3000		DD30-471	3KV-471	DC30347			K-2347
C6	7.8		33-2672						
C7	1.8		33-2424	TCZ-1R5	N POA-1R5	ZT-5S15			
C8	1000		33-2677						
C9	300		33-2331	DD-801	831-801	DC-521			
C10	.5-3		33-2453	829-3	3U15-01-0R5	CT565A			
C11	1000		33-2677						
C12	25		33-2671	TCN-25	N750K-250				
C13	51		33-2676						
C14	9		33-2674						
C15	22		33-2672	TCN-22	N750K-220				
C18	3		33-2675						
C17	600		33-2331	DD-801	831-801	DC-521			
C18	1000		33-2677						
C19	1000		33-2677						
C20	1000		33-2677,						
C21	.1	300	33-1777	DF-104		PT401	IMP2-P1	330201	
C22	470		33-C	DD-471	831-471	UC-5347		K-1347	
C23	36		33-2593	TCZ-20	NPOK-200	ZT-543		CK-1420	
C24	50		33-2654	TCZ-50	NPOK-500	ZT-545		CK-1450	
C25	330		33-2309	DB-331	GP2K-331	UC-5333		K-1333	
C26	1000		33-7	DD-102	801-001	DC-521		K-1210	
C27	470		33-2302	DB-471	GP2K-471	UC-5347		K-1347	
C28	1000		33-7	DD-103	801-001	DC-521		K-1210	
C29	800		33-3577	MFT-1000					
C30	330	500	33-1645	DB-331	GP2K-331	UC-5333		K-1333	
C31	1000		33-7	DD-102	801-001	DC-521		K-1210	
C32	7		33-3575						
C33	.047	200	33-1718	DF-503		PT4167	IMP2-S47	3302147	
C34	4700		33-2634	DD-473	81J-0047	DC-525	IMP6-D47	C-1247	
C35	47		33-2627	TCZ-47	NPOK-470	ZT-5447		KR-1447	
C36	.1	300	33-1777	DF-104		PT401	IMP2-P1	330201	
C37	3.3		33-2343	TCZ-3R3	NPOA-3R3	ZT-5333		K-1450	
C38	50		33-2460	D6-500	GP1K-500	UC-545			
C39	3.4		33-2589						
C40A	1000		33-2545	DD3-102	81J-001	DCD-521		K-1210	
B	1000							K-1210	
C41	10		33-2578						
C42	470		33-C	DD-471	831-471	UC-5347		K-1347	
C43	10000		33-3	DD-103	81J-01	DC-521	IMP6-S1	330801	
C44	2200		33-2	DD-223	81J-0022	UC-5322	IMP6-D22	C-1222	
C45	.1	300	33-1777	DF-104		PT401	IMP2-P1	330201	
C46	.1	300	33-1777	DF-104		PT401	IMP2-P1	330201	
C47	.1	300	33-1777	DF-104		PT401	IMP2-P1	330201	
C48	470		33-C	DD-471	831-471	UC-5347		K-1347	
C49	4700		33-2659	DD-472	81J-0047	DC-525	IMP6-D47	C-1247	
C50	2200		33-11	DD-222	81J-0033	UC-5323	IMP6-D33	C-1233	
C51	.1	600	33-3061	DF-104		PT401	IMP4-P1	330401	
C52	.0068	600	33-2268						
C53	.01	600	33-2565						
C54	3300		33-18					CR-1233	
C55	.0033	600	33-1854					CR-1233	
C56	.033	600	33-2535						
C57	.047	200	33-1718	DF-503		PT4167	IMP2-S47	3302147	
C58	.01	600	33-1846	DE-103		PT401	IMP4-P1	330411	
C59	68	500	33-3565	D6-680	801-680			KR-1468	
C60	75		33-1746	D6-750	801-750	UC-5475		K-1475	
C61	1000		33-17	DD-102	801-001	DC-521		K-1210	
C62	4700		33-2624	DD-472	81J-0047	DC-525		C-1247	

CAPACITORS (cont)

ITEM No	RATING: CAP.	RATING: VOLT	REPLACEMENT DATA: ZENITH PART No.	CENTRALAB PART No.	ERIE PART No.	MALLORY PART No.	PYRAMID PART No.	SANGAMO PART No.	NOTES
C63	1000		33-7	DD-103	801-001	DC-521		K-1310	
C64	.15	200	33-2166			PT4015	IMP3-P15	3303015	
C65	.0033	400	33-2694					CR-1233	
C66	100		33-9	DD-101	801-101	UC-535		K-1310	
C67	330		33-2667	D6-331	81J-331			KR-1333	
C68	680	500	33-2668	D6-681	81J-681			KR-1368	
C69	220		33-2458	D6-221	GP2K-221	UC-5322		K-1322	
C70	.047	400	33-1775	DF-503		PT4147	IMP4-S47	3304147	
C71	150	4000	33-3683					C-5316	
C72	.15	400	33-2261			PT4015	IMP4-P15	3304015	
C73	72	2000							
C74	10000	1400	33-2655						

CONTROLS

ITEM No	RATING: RESIST. ANCE	RATING: WATTS	REPLACEMENT DATA: ZENITH PART No.	IRC PART No.	CLAROSTAT PART No.	CENTRALAB PART No.	MALLORY PART No.	INSTALLATION NOTES
R1A	1Meg	1	53-3273	QH-137	A47-1Meg-S	B-69-S	U-54	Volume
B	Shaft		Not Req.	Not Req.	FS-3	Not Req.	Not Req.	Attach to R1A
C	Switch		Not Req.	76-1	SWE-13	Not Req.	UA-20	Attach to R1A
R2A	7000Ω	2	53-3260	WK-7500	A43-7500	Y-136	R-7500L	Contrast (wire wound)
B	Shaft		Not Req.	Not Req.	FK3-1/4	Not Req.	Not Req.	Attach to R2A
R3A	50Ω	½	53-3261	QH-133	A47-50K-S	BK-31	TAP54L	Horiz. Hold
B	Shaft		Not Req.		RN-3	Not Req.	Not Req.	Attach to R3A
R4A	8.5Meg	½	53-3262	QH-143	A47-7.5Meg-S	AB-89	TAP855L	Height-Stop ③ 1Meg-Note 1
B	Shaft		Not Req.	TQ	RN-3	AK-19	Not Req.	Attach to R4A
R5A	3500Ω	½	53-3266	QH-114	A47-4000-S	AB-9	TA353L	Vert. Linearity
B	Shaft		Not Req.	TQ	RN-3	AK-19	Not Req.	Attach to R5A
R6A	750KΩ	½	53-3263	QH-136	A47-750K-S	AB-66	TAP754L	Vert. Hold
B	Shaft		Not Req.	TQ	RN-3	AK-19	Not Req.	Attach to R6A
R7A	500KΩ	½	53-3264	QH-133		AB-61	TAP55R	Brightness
B	Shaft		Not Req.	TQ		AK-19	Not Req.	Attach to R7A
R8	175Ω	2	53-3284		2B-800			Buzz (wire wound)

Note 1. Connect a 1Meg resistor in series with the rigid hand terminal of the control and the lead connecting to the same terminal of the original control. (control viewed from the shaft end, terminals down).

RESISTORS

ITEM No	RATING: OHMS	RATING: WATT	REPLACEMENT DATA: ZENITH PART No.	IRC PART No.	NOTES
R9	470KΩ	½	53-1896	BTS-470K	
R10	100KΩ	½	53-1896	BTS-470K	
R11	15KΩ	½	53-1834		
R12	100KΩ	½	53-1869		
R13	100KΩ	½	53-1869		
R14	2700Ω	½	53-1573	BTS-2700	
R15	100KΩ	½	53-1869		
R16	15KΩ	½	53-1834		
R17	100KΩ	½	53-1869		
R18	10KΩ	½	53-1827		
R19	390Ω	½	53-1768	BTS-390	
R20	12KΩ	½	53-1091		
R21	560KΩ	½	53-1901	BTS-5600K	
R22	1Meg	½	53-1911	BTS-1Meg	
R23	2.2Meg 5%	½	53-1954	BTS-2.2Meg 5%	
R24	4.7Meg	½	53-1940	BTS-4.7Meg	
R25	2.2Meg	½	53-1925	BTS-2.2Meg	
R26	5.6Meg 5%	½	53-1942	BTS-5.6Meg 5%	
R27	220KΩ	½	53-1853	BTS-220K	
R28	3.9Meg	½	53-1936	BTS-3.9Meg	
R29	680KΩ	½	53-105	BTS-680K	
R30	1.5Meg	½	53-1919	BTS-1.5Meg	
R31	150KΩ	½	53-1838		
R32	1000Ω	½	53-1786	BTS-1000	
R33	37KΩ	½	53-1845		
R34	56Ω	½	53-1733	BTS-56	
R35	1000Ω	½	53-1786	BTS-1000	
R36	2.2Meg	½	53-1925	BTS-2.2Meg	
R37	2700 5%	½	53-1761	BTS-270 5%	
R38	6800Ω	½	53-1821		
R39	470Ω	½	53-1772	BTS-470	
R40	470Ω	½	53-1772	BTS-470	
R41	120KΩ	½	53-1873		
R42	120KΩ	½	53-1873		
R43	15Ω	½	53-1706	BTS-15	
R44	10KΩ	½	53-1196		
R45	1KΩ	½	53-1091		
R46	82Ω	½	53-1740	BTS-82	
R47	4700Ω	½	53-1815		
R48	33KΩ	½	53-1841		
R49	1Meg	½	53-1911		
R50	47KΩ	½	53-1194		
R51	68Ω	½	53-1716		
R52	22KΩ	½	53-1841		
R53	2700Ω	½	53-1573		
R54	33KΩ	½	53-1849		

ITEM No	RATING: OHMS	RATING: WATT	REPLACEMENT DATA: ZENITH PART No.	IRC PART No.	NOTES
R55	100KΩ	½	53-1870		
R56	100KΩ	½	53-1870	BTS-100K	
R57	33KΩ	½	53-1849	BTS-33K	
R58	22KΩ	2	53-3141	BTS-22K	
R59	68Ω	½	53-1719	BTS-680	
R60	680KΩ	½	53-1904	BTS-680K	
R61	470Ω	1	53-1771	BTA-470	
R62	680Ω	1	53-3290	BTA-680	
R63	220KΩ	½	53-1864	BTS-220K	
R64	390KΩ	½	53-1894		
R65	100KΩ	½	53-1869		
R66	33KΩ	½	53-1848		
R67	270KΩ	½	53-1857		
R68	15KΩ	½	53-1834		
R69	39KΩ	½	53-1852		
R70	39KΩ	½	53-1852		
R71	100KΩ	½	53-1869		
R72	220Ω	½	53-1758		
R73	2.2Meg	½	53-1926		
R74	100KΩ	½	53-1870		
R75	680Ω	1	53-3281		
R76	68Ω	½	53-1737		
R77	560Ω	½	53-1775		
R78	560Ω	½	53-1775		
R79	4700Ω	½	53-1813		
R80	1MΩ	½	53-1911		
R81	1Meg	½	53-1911		
R82	100KΩ	½	53-1869		
R83	1Meg	½	53-1911		
R84	15KΩ	½	53-1065		
R85	100KΩ	½	53-1870		
R86	330KΩ	½	53-1890		
R87	470KΩ	½	53-1898		
R88	10000Ω	½	53-1795		
R89	150KΩ	1	53-3313		
R90	150KΩ	½	53-1831		
R91	470KΩ	½	53-1898		
R92	100Ω	½	53-1744		
R93	100Ω	½	53-1744		
R94	6200Ω	2	53-1101		
R95	47KΩ	2	53-3282		
R96	150KΩ	½	53-1877		
R97	2.2Ω	½	53-3114	BW½-2.2	
R98	50Ω	25	53-3272	2D-50	
R99	7.5Ω	5	53-3289		
R100	470KΩ	½	53-1896	BTS-470K	
R101	470KΩ	½	53-1896	BTS-470K	

TRANSFORMERS (SWEEP CIRCUITS)

ITEM No	USE	REPLACEMENT DATA: ZENITH PART No.	Hallodorson PART No.	Merit PART No.	RCA TYPE No.	Ram PART No.	Stancor PART No.	Thordorson PART No.	Triad PART No.
T1	Horiz. Output Trans.	B-33451 ①							
T2	Vert. Output Trans.	95-1421	Z180S ②	A-3036 ②		V307 ②④	A-8115 ②	26873	A-108X ② & A-109X ②
T3A	Yoke-Horiz. (12.6MH)	95-1437	DF606 ②	MDP-91 ②			DY-13A ②	Y-14 ④	Y-46-1 ④
B	Vert. (42MH)								

① Complete assembly includes: Tertiary winding (Zenith part #B-3246), winding and terminal assembly (Zenith part #B-33448).
② Connect as auto transformer.
③ Drill new mounting hole(s).
④ Connect horizontal damping network across terminals #3 and #7; use original network if necessary.

TRANSFORMER (AUDIO OUTPUT)

ITEM No	IMPEDANCE: PRI.	IMPEDANCE: SEC.	ZENITH PART No.	Hallodorson PART No.	Merit PART No.	Stancor PART No.	Thordorson PART No.	Triad PART No.	NOTES
T4	10.7K	3.2Ω	95-1428	2U17 ①	A-2932 ①	A-3850 ①	24S52 ①	S-11X	① Drill one new mounting hole.

SPEAKER

ITEM No.	RATINGS: SIZE	RATINGS: FIELD	RATINGS: V C IMP	REPLACEMENT DATA: ZENITH PART No	REPLACEMENT DATA: QUAM PART No	NOTES
SP1	4"	PM	3.2Ω	49-750	4A07	

COILS (RF-IF)

ITEM No.	USE	DC RES.: PRI.	DC RES.: SEC.	ZENITH PART No.	MEISSNER PART No.	MERIT PART No.	MILLER PART No.	NOTES
L1	Antenna trans.	.1Ω	.1Ω•	S-22078				*Tapped
L2	Antenna coil	0Ω		20-561				Channel 12
L3	Antenna coils	0Ω						Channels 7 thru 13
L4	Antenna coil	0Ω		20-558				Channel 6
L5	Antenna coil	0Ω		20-558				Channel 5
L6	Antenna coil	0Ω		20-558				Channel 4
L7	Antenna coil	0Ω		20-558				Channel 3
L8	Antenna coil	0Ω		20-558				Channel 2
L9	Neut. coil	0Ω		20-560				
L10	RF coil	0Ω		20-559				Channel 13
L11	RF coils	0Ω		20-571				Channels 7 thru 13
L12	RF coil	0Ω		20-579				Channel 6
L13	RF coil	0Ω		20-580				Channel 5
L14	RF coil	0Ω		20-581				Channel 5
L15	RF coil	0Ω		20-581				Channel 4
L16	RF coil	0Ω		20-581				Channel 3
L17	RF coil	0Ω		20-581				Channel 2
L18	Fil. choke	0Ω						
L19	Osc. coil	0Ω		20-549				
L20	Osc. coil	0Ω		20-577				Channel 13
L21	Osc. coils	0Ω						Channel 7 thru 13
L22	Osc. coil	0Ω		20-576				Channel 6
L23	Osc. coil	0Ω		20-575				Channel 5
L24	Osc. coil	0Ω		20-574				Channel 4
L25	Osc. coil	0Ω		20-573				Channel 3
L26	Osc. coil	0Ω		20-572				Channel 2
L27	Feed-back coil	0Ω		20-551				
L28A	Conv. plate	.8Ω		S-22549				
L28A	1st video IF	.1Ω		S-22722				
B	4.5MC trap	0Ω						
L30	2nd video IF	.1Ω	.1Ω	S-22344	17-5009•	TV-137•	6232•	Core Part No. 148-150
L31	3rd video IF	.1Ω	.1Ω	S-22345	17-5004•	TV-135•	6234•	Core Part No. 148-150
L32	Series peaking coil	4.4Ω		S-22444		19-2022		48 Microhenries
L33	Shunt peaking coil	13Ω		S-22475		19-2300		6346
L34A	4.5MC trap	13Ω		S-22350				875 Microhenries
B	1st sound IF	4.7Ω						Core Part No. 148-99
L35	Series peaking coil	5.5Ω		S-20880	19-3128•	TV-125	6153•	137 Microhenries, wound on 18KΩ resistor
L36	2nd sound IF	.3Ω	.3Ω	S-22347	17-5495•	TV-113•	6303•	
L37	Quad ratios detector	4.8Ω		S-19220	20-1004•	TV-151•	1480•	Core Part No. 148-150
L38	Horiz. osc.	100Ω		S-22353	19-1576	TV-163	6210	Core Part No. 148-152

•Use adaptor plate & detune trap.
•Use adaptor plate.
▲Parallel with 18KΩ resistor.
•Drill mounting hole.

FILTER CHOKE

ITEM No	RATINGS: TOTAL DIRECT CURRENT (DC)	RATINGS: D C RESISTANCE	RATINGS: INDUCTANCE (@ CURRENT (DC))	REPLACEMENT DATA: ZENITH PART No	Hallodorson PART No.	Merit PART No.	Stancor PART No.	Thordorson PART No.	Triad PART No.
L39	.250ADC	65Ω	1.84HY	95-1376	C5037 ①	C-3928 ①	C-3236 ①	36C44	C-33X

① Drill one new mounting hole.

PARTS LIST AND DESCRIPTIONS (Continued)

SELENIUM RECTIFIER

ITEM No.	RATING	REPLACEMENT DATA						NOTES
	CURRENT	ZENITH PART No.	FEDERAL PART No.	INTERNATIONAL PART No.	MALLORY PART No.	RADIO RECEPTOR PART No.	SARKES TARZIAN PART No.	
M1	.250ADC	212-14	1090A	MR-300	6S300	6Q4	300	
M2	.250ADC	212-14	1090A	MR-300	6S300	6Q4	300	

FUSES

ITEM No.	TYPE	RATING	REPLACEMENT DATA					
			ZENITH PART No.		LITTELFUSE PART No.		BUSS PART No.	
			FUSE	HOLDER	FUSE	HOLDER	FUSE	HOLDER
M3	3AG S/B	175MA 125V	136-21	83-1683	313.175 (3AG-S/B-175MA)	357001	MDL 175/1000	4405

CRYSTAL DIODES

ITEM No.	ORIG. TYPE	REPLACEMENT DATA		NOTES
		ZENITH PART No.	SYLVANIA PART No.	
M4	CK706	103-1	1N60/1N132	Video Detector

MISCELLANEOUS

ITEM No.	PART NAME	ZENITH PART No.	NOTES
M5	Tuner	S-22452	VHF
M6	Video Det. Assy.	S-22346	Includes M4, C32 and Video IF Coil.
M7	Switch	85-564	Local-Distance (DPDT-Slide Type)
M8	Integrator	87-1	Vertical
M9	Width Control	199-193	
M10	Centering Device	S-22560	
M11	Ion Trap	S-22574	
	Cabinet	14-1808	Shell - Model T1814R
	Cabinet	14-1809	Shell - Model T1816B
	Cabinet	14-1810	Shell - Model T1816L
	Cabinet	14-1811	Shell - Model T1816E
	Cabinet	14-808	Shell - Model T1816R
	Knob	46-1364 or 46-1365	Channel Selector - Model T1814R
	Knob	46-1369	Channel Selector - Models T1816B, E & L
	Knob	46-1368	Channel Selector - Model T1816R
	Knob	46-1366 or 46-1367	On-off-volume - Model T1814R
	Knob	46-1337	On-off-volume - Models T1816B, E & L
	Knob	46-1335	On-off-volume - Model T1816R
	Knob	46-1263	Fine tuning - Model T1814R
	Knob	46-1353	Fine tuning - Models T1816B, E, L & R
	Knob	46-1373	Brightness, Contrast, Vert. & Horiz. Hold - Models T1814R, T1816R
	Knob	46-1374	Brightness, Contrast. Vert. & Horiz. Hold - Models T1816B, E, & L
	Safety Glass	192-195	

TROUBLE SHOOTING AIDS (cont)

PROPERTY OF
L. F. BLANKENSHIP
3924 MEADE ST.
DENVER, COLORADO

HIGH VOLTAGE

LOSS OF HIGH VOLTAGE

Check by substitution V12, V13, V14 and V15. Check fuse, M3. Check waveform W15.

If Satisfactory	If Unsatisfactory
Check T1, T3A, C70, C71, C72, R94 and other associated components.	Check L38, C65, C66, C67, C69, R84, R87, R89 and other associated components.

INSUFFICIENT HIGH VOLTAGE

Check by substitution V13 and V14. Check M1 and M2. Check R94, R99, C1, C69 and other associated components.

BLOOMING

Check by substitution V13, V14 and V15. Check M1 and M2. Check R94, R99, C1, C69 and other associated components.

GENERAL

RASTER, SOUND, NO PICTURE

Follow procedure outlined under "Loss of Video."

RASTER, PICTURE, NO SOUND

Follow procedure outlined under "Weak or no Sound."

RASTER, NO SOUND, NO PICTURE

Check by substitution V1, V2, V3, V4, V5 and V6. Check video IF components for failure or change of value.

NO RASTER, NO SOUND

Follow procedure outlined under "Dead Set."

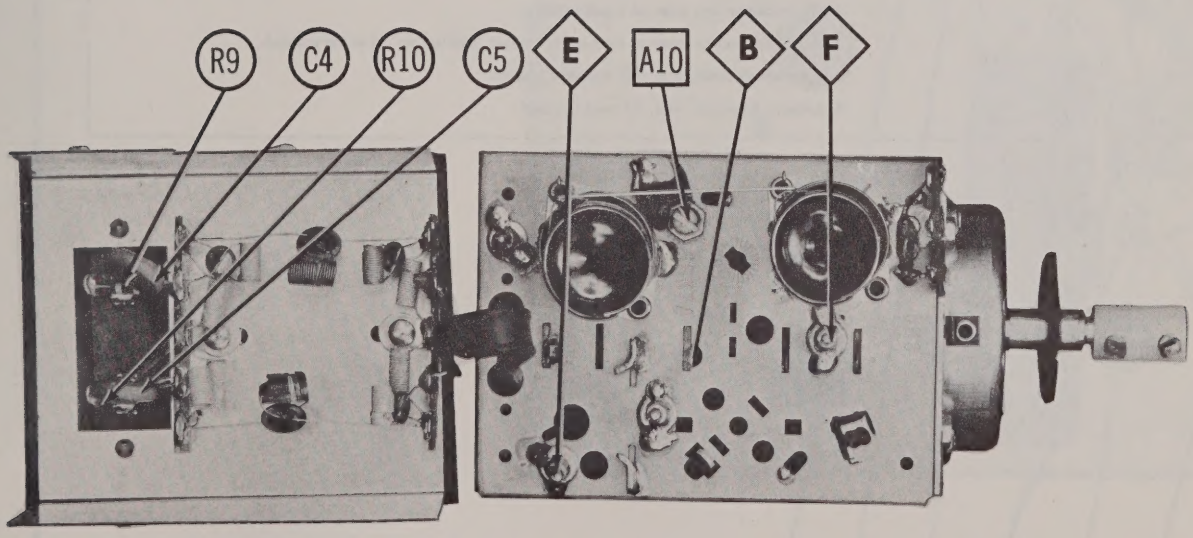
KEYSTONE EFFECT

Check T3 and its associated components.

INTERMITTENT STREAKS

Check high voltage section for corona discharge and arcing.

Symptoms shown are assumed and are not indicative of the quality and workmanship of this equipment.



RF TUNER TOP VIEW

SERVICING IN THE FIELD

TUNER OSCILLATOR ADJUSTMENTS

Touch-up adjustments of the VHF tuner oscillator circuit may be accomplished by removing the channel selector and fine tuning knobs.

PICTURE TUBE SAFETY GLASS CLEANING

To clean safety glass, remove channel selector, fine tuningand on-off-volume control knobs. Remove 6 metal screws holding 2 metal knob escutcheons. Remove knob escutcheons and safety glass. Use extreme caution when removing safety glass.

PICTURE TUBE REMOVAL

For picture tube removal it is necessary to remove chassis. (See disassembly instructions).

SERVICE ADJUSTMENT LOCATION

See cabinet rear view on page 11.

HORIZONTAL OSCILLATOR FIELD ADJUSTMENT

For adjustment of the horizontal stabilizer coil (L38) it is necessary to remove the rear cover and supply power to the set.

Set the horizontal hold control to its center range position and adjust L38 until the picture synchronizes horizontally.

SOUND IF DETECTOR BUZZ ADJUSTMENT

Adjust the buzz control (R8) located on top of the chassis for maximum volume and minimum noise (See tube placement chart).

FUSES

One fuse is used for horizontal and vertical sweep circuit protection. (For location see tube placement chart).

CENTERING

Centering is accomplished mechanically by adjusting two magnetic rings around the neck of the picture tube, located flush against the deflection yoke. Rotate the two rings around the neck of the tube until the picture is properly centered.

WIDTH CONTROL ADJUSTMENT

The width is adjusted by sliding and turning the brass sleeve located on the neck of the picture tube. A setting will be found which results in proper width and linearity.

DISASSEMBLY INSTRUCTIONS

CHASSIS REMOVAL

1. Remove 4 push-on type control knobs from top panel of cabinet.
2. Remove 8 metal screws. Remove rear cover.
3. Disconnect speaker leads.
4. Lay receiver face down on a soft surface.
5. Remove 4 metal screws at the rear of cabinet (2 at the top - 2 at the bottom).
6. Lift cabinet straight up until it clears chassis.
7. Remove 2 speaker nuts. Remove speaker.

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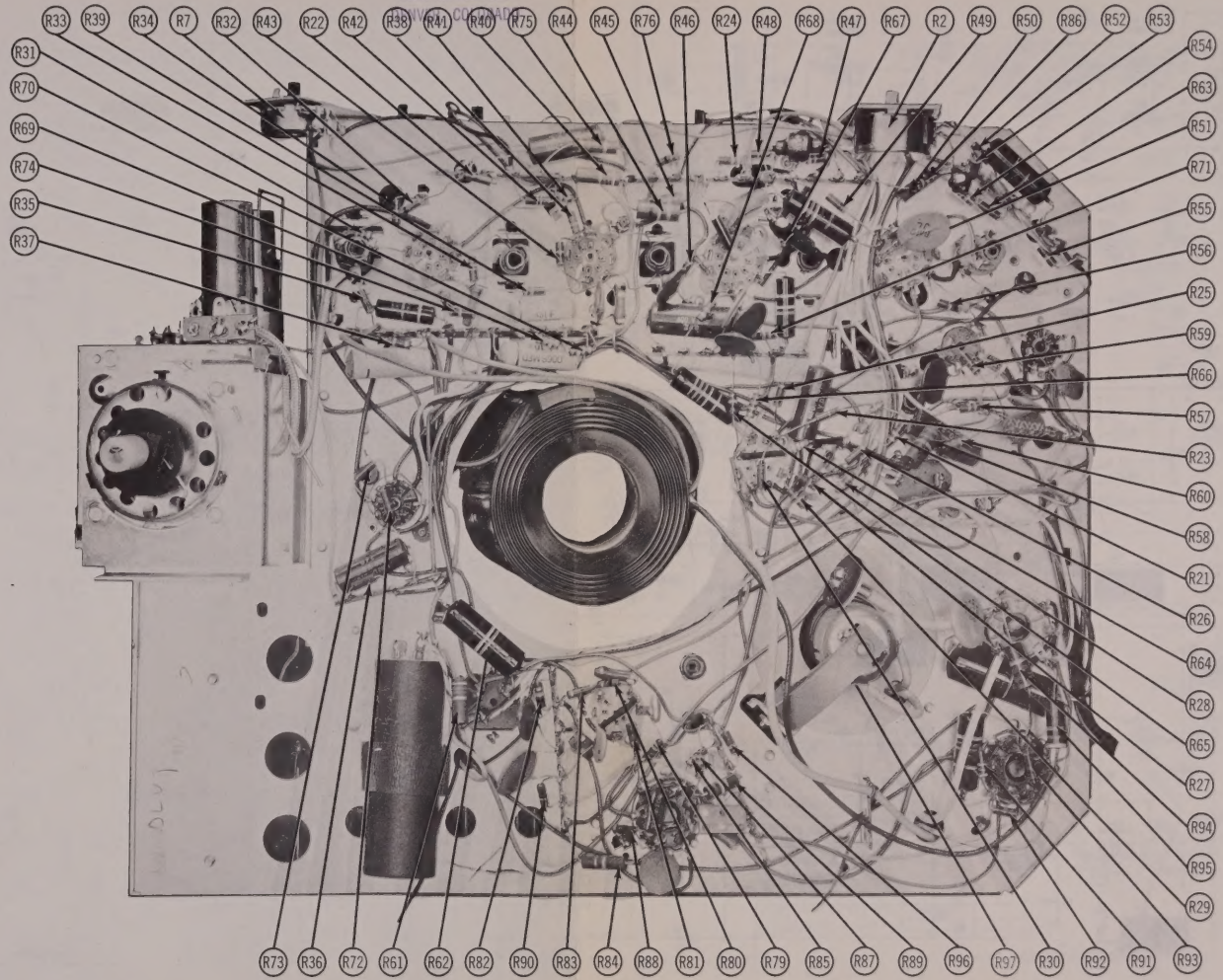

CHASSIS BOTTOM VIEW-RESISTOR IDENTIFICATION